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The Hayden Planetarium of the American Museum of Natural History

By CLYDE FISHER*

The first projection planetarium, a device developed by Carl Zeiss of Jena for the purpose of giving an accurate and realistic representation of the sky, was installed ten years ago in the famous Deutsches Museum in Munich. The first to come to America was the Adler Planetarium in Chicago, which attracted so much attention in connection with the Century of Progress Exposition. The second one established in America is the Fels Planetarium at the Franklin Institute in Philadelphia. The third promises to be the Griffith Planetarium almost ready to be opened in Los Angeles. It now seems quite certain that the fourth in our country will be the Hayden Planetarium at the American Museum of Natural History in New York City.

Devices to show the movements of the planets and our moon in relation to the sun have been constructed since the early days of Copernican astronomy, and no doubt previous to the announcement of the sun-centered theory of our solar system there were devices to illustrate Ptolemy's earth-centered system. As early as the latter half of the Sixteenth century, the great Dutch astronomer, Huygens, and the great Danish astronomer, Roemer, built a planetarium to represent the solar system, as it was then known, according to the new Copernican theory, and doubtless this invention had much to do with the general acceptance of the sun-centered notion of our family of worlds.

After the general acceptance of the Copernican theory of astronomy, a great variety of instruments was made for the purpose of showing the relative motions of the then known bodies in our solar system,—many of them crude, but for the most part very helpful. Some were limited to the earth and sun and moon, others just to the earth and the moon, and still others to the sun and all the known planets and satellites.

One of the most interesting and complicated of these early instruments was built in England for Charles Boyle, the fourth Earl of Orrery, and this one gave us a new word for our dictionaries. The word "orrery" has come to be applied to this type of planetarium.

The most famous orrery or planetarium of this type to be made in America was devised and built by the "Father of American Astronomy," David Rittenhouse of Philadelphia. It is one of the most highly prized of the historical instruments in the Franklin Institute in Philadelphia, where it may now be seen.

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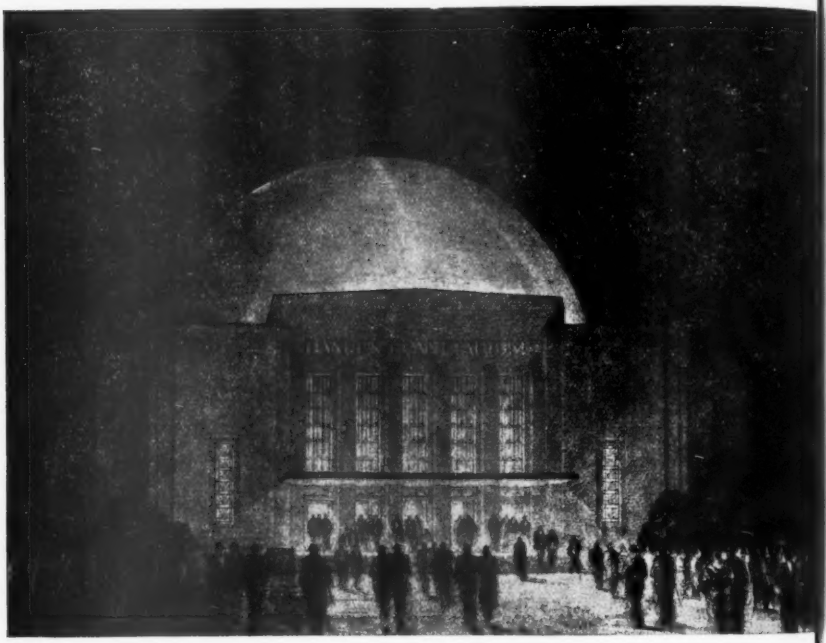
Probably the largest, and certainly one of the best of these old-fashioned Copernican planetariums ever made is installed in the world-famous Deutsches Museum in Munich. Briefly it may be described as follows: A lighted globe in the center represents the sun. The six planets nearest the sun, with their satellites,—the planets and satellites all revolving at their proper relative speeds,—are represented. The diameter of Saturn's orbit is about thirty-five feet. Uranus and Neptune are left out because of the tremendous size of their orbits as com-



THE HAYDEN PLANETARIUM.
Artist's rendering of the front elevation as it will appear when completed. The building will face on 81st Street near Central Park West.

pared with the four inner planets. Pluto had not been discovered when the instrument was built, but its enormously larger orbit would all the more preclude the possibility of including it. There is no light during demonstrations except from the central sun; and the walls, ceiling, and floor are painted black. Consequently, the continual change from day to night and from night to day is well shown on all of the six planets, and so are the phases of our moon. For the lecturer or demonstrator, a small car travels around under the earth, which goes around the sun in twelve minutes, the entire apparatus being propelled by an electric mo-

tor. By means of a wide-angled periscope, which makes it possible to see Venus and Mercury from the level of the plane of the ecliptic, the phases of these inner planets can easily be observed. The constellations of the zodiac are shown in a belt on the wall, with their names in white letters and with the degrees of celestial longitude marked. The principal stars of the zodiacal constellations are shown by lights back of small, round holes in the black wall.

In short, these planetariums or orreries consisted of a series of globes to represent the various bodies of our solar system, each revolving globe supported by a metal rod, the whole system of sun and planets and satellites being connected and propelled by gears so that their relative motions were approximated. Ever since their first appearance, these devices have had and still have great value in teaching, the three-dimensional mechanism capable of simulating the motions of the heavenly bodies being incomparably more effective than flat pictures or pages of printed text.

In these mechanisms just described, the observer is outside looking on,—a condition that has been improved by placing the model of the solar system inside a spherical glass globe, upon the outside of which are represented the constellations with their principal stars and also the Milky Way,—a transparent celestial sphere, certainly an improvement over the usual opaque celestial globe. Examples of this type are the "Astrophane," made by Mr. O. J. Russert, and the small Copernican planetarium, just inside the entrance of the Fels Planetarium, made by Max Sendtner of Munich.

The next step in the evolution of the planetarium seems to be the model of the celestial sphere with the audience inside. This type has been developed in at least three different countries. In 1758, Roger Long, Lowndes Professor of Astronomy at Cambridge, built one at Pembroke College. The globe was eighteen feet in diameter and seated thirty persons. (Described in "A Cycle of Celestial Objects," by Smyth and Chambers, pp. 208-209. Oxford, 1881.) The only one of these that the writer has seen is the one in the Museum of the Chicago Academy of Sciences in Lincoln Park, built before 1913 by Dr. W. W. Atwood, now President of Clark University. It is known as the Atwood Celestial Sphere. It consists of a hollow metal sphere, in which the most conspicuous stars of the sky are shown by lights outside of small, round holes through the sphere. The small audience is seated inside the globe, while the latter revolves as the real sky seems to do. In all of these devices heretofore described so many astronomical bodies and so many movements and relations have been omitted that they are evidently inadequate.

Late in 1924 there appeared something new under the sun, an apparatus that shows every object in the sky that is visible to the unaided eye, and in a most realistic manner. The rising and setting of the sun, moon, and stars are represented just as they occur in nature, due to the rotation of the earth on its axis. The moon goes through its phases,

The planets are shown as wanderers among the stars, their direct eastward and their retrograde westward motions being represented with great accuracy. Even the precession of the equinoxes, together with the swinging of the celestial pole around a circle, which in the sky takes 26,000 years, is shown by this apparatus.

In this new projection planetarium there are no globes to represent the heavenly bodies, and no holes through a large globe with lights back of them, but everything is shown on the inside of a dome by projection of light from a central apparatus. The optimum size for this inverted bowl is from sixty-five to seventy-five feet in diameter. This hemispherical dome, which is white inside, becomes our artificial sky, and since there are no pillars or posts to intercept the light, the illusion of the depth of space is perfect. One feels that he has been suddenly transported outside under a clear night sky. The realistic appearance is beyond belief.

THE ZEISS PROJECTION PLANETARIUM.
The demonstration in the dome, showing instrument, artificial horizon line, lecturer, and audience.

The projection apparatus, which is located on the floor in the center of the dome, is a bizarre-looking instrument some twelve feet high resembling a huge dumb-bell with a long bar between the globular ends. The globes at either end of the instrument are for the projection of the fixed stars, one globe being for the northern and the other for the southern hemisphere of the sky. Each globe consists of sixteen stereopticons pointing in all directions with one central lamp. The lantern slides or diapositives are not square or rectangular, but are so shaped that their images fit together like the cells of a honey-comb, thus making a complete picture of the starry heavens without overlapping and without gaps.

The representation of the fixed stars, including the Milky Way, is a comparatively simple part of the performance of the instrument, and yet it is certainly the most impressive. It matters not whether the audience be made up of children or adults, professional people or laymen, the emotional experience is always the same. When the light is gradually diminished bringing on the darkness of night in the dome, and the stars are "turned on," the audience gasps audibly in surprise at the breath-taking beauty of it. No one is prepared for anything so realistic and so dramatic.

Upon my visit to Jena in 1925,—made for the purpose of examining the first projection planetarium to be built,—when I congratulated the inventor, Dr. Ing. W. Bauersfeld, he admitted to me that the illusion of the immensity of space and the realistic representation of the fixed stars, including the Milky Way, had exceeded even his expectations. Due to some sub-conscious imagination, perhaps,—at least for some psychological or physiological reason, this artificial sky seems to possess the deep night blue seen in the real sky, and yet there is no blue color on the inside of the dome and none in the projection apparatus.

The names of the constellations may be shown on this artificial sky by means of a special set of projectors. The advantage of this over outdoor star-gazing in learning the constellations is obvious. With an optical pointer, or flashlight showing an arrow-shaped light, the lecturer can point out any star, planet, or other body in the sky. It is evident that an ordinary fish-pole pointer, even with a tiny light at the tip, would be precluded by the large size of the dome.

In the bar of the dumb-bell, between the globular assemblages of stereopticons showing the stars, are seven special projectors, one for each of the five planets visible to the unaided eye from the earth and one each for the sun and moon. From the standpoint of the inventor, these projectors which show the "wandering" of the planets including their periodical retrograde motions, the phases of the moon, etc., were the most difficult to perfect.

The whole apparatus has several different speeds, all of which are many times faster than the real motions. This makes it possible to condense a very long astronomical story into a very short time, and with increase rather than loss of drama. So that a child or a grown-up, who has not stopped learning, can get a clear understanding, in a few minutes, of the seemingly intricate, though actually simple workings of the heavenly bodies.

With the projection planetarium, one can change his latitude at will. He can go to the Land of the Midnight Sun or, indeed, to the North Pole and observe the apparent movements of the sun and moon and stars from there; or he can go to the equator, or to southern latitudes and see the Magellanic Clouds, the nearest fixed star visible to the unaided eye, and the romantic Southern Cross.

With the projection planetarium, one can go backward or forward in time. He can set the instrument back say 2,000 years and note with

accuracy the configuration of the planets among the stars at that time; or he can set it back 5,000 years, say to 3,000 B.C. when Alpha Draconis, the brightest star in the constellation, The Dragon, was the North Star; or he can set it forward 12,000 years when Vega will be the North Star, and the Southern Cross will be visible from the latitude of New York.

Dr. Philip Fox, formerly professor of astronomy and director of the Dearborn Observatory at Northwestern University, brought the first Projection Planetarium to America and introduced it to our people. Thanks to the generosity of Mr. Max Adler, it has been established in Chicago in conjunction with the best astronomical museum in America, and Dr. Fox is Director.

Made possible by the generosity of Mr. Samuel Fels, the second American projection planetarium has been installed in the Franklin Institute in Philadelphia, where it was opened the first of last November. Mr. James Stokley, formerly of *Science Service*, is the Director.

The third American projection planetarium is soon to be installed in a building nearing completion in Griffith Park, Los Angeles. It now seems quite certain that New York City will have the fourth American projection planetarium. In the whole world there are now about a score of these remarkable instruments in operation, about a dozen in Germany, two in Italy, two in America, one in Austria, one in Sweden, and one in Russia.

Many of the greatest astronomers of the world have expressed in enthusiastic words their approval of this new device.

Dr. R. G. Aitken, Director of the Lick Observatory,—"The Zeiss Planetarium is the most remarkable instrument that has ever been devised to exhibit impressively, and with the illusion of reality, the motions of the heavenly bodies and the phenomena which result from these motions."

Dr. Walter S. Adams, Director of the Mount Wilson Observatory,—"The Zeiss Planetarium . . . would prove of great educational value, fixing in the minds as no description could do the simple astronomical principles which everyone should know."

Dr. Elis Strömgren, Director of the Royal Danish Observatory in Copenhagen,—"Never was a medium of demonstration produced as instructive as this, never one more fascinating in effect, and certainly never one which appeals to everybody as this does. It is a school, theatre, and film all in one, a lecture hall under the vault of the heavens, and a drama in which the celestial bodies are the actors. No description, no photograph, no drawing can possibly reproduce the overwhelming impression made by a demonstration in a Zeiss Planetarium."

The educational value of the projection is now widely recognized. In Italy the naval cadets are required to attend regularly the demonstrations at the Planetarium in Rome in order to acquire their navigational astronomy. In the Fels Planetarium in Philadelphia, besides the usual demonstrations with lectures to the general public, classes in astronomy

from Swarthmore College come to the Planetarium once a week for special instruction by Dr. John H. Pitman, professor in charge, and this opportunity is enjoyed by students from Villanova College also. Dr. Pitman says that the students get more astronomy in an hour in the Planetarium than in a week of lectures without its aid. Dr. Caroline E. Furness, Professor of Astronomy at Vassar College, in a congratulatory letter has written: "A planetarium will be of great benefit to me and my classes. . . . You may expect me to be a steady visitor when once the building is finished."

Enthralled by a Demonstration of the Projection Planetarium.

With Dr. Oskar von Miller, Director Emeritus of the Deutsches Museum in Munich, and with Mr. Waldemar Kaempffert, Science Editor of the *New York Times* and former Director of the Museum of Science and Industry in Chicago, we believe that a combination of the Projection Planetarium and a large Copernican Planetarium, similar to the one in the Deutsches Museum, will make an ideal teaching unit, and in accordance with this belief we have planned to install both types of planetarium in our new building.

Dr. George Ellery Hale, Dean of American Astronomers, Honorary Director of Mt. Wilson Observatory, and member of our Advisory

Committee, in a congratulatory letter upon the assurance of our planetarium has made the following recommendation to the Director of the American Museum: "I greatly hope its equipment will include a telescope of about 12 inches aperture, and such other instruments and exhibits as those under preparation for the new Planetarium and Public Observatory at Griffith Park, Los Angeles. In my opinion, based upon many years of experience at the Yerkes and Mt. Wilson Observatories, the public will not be contented with the Planetarium alone, but will wish for an opportunity to observe the sun, stars, and planets with a telescope and the necessary auxiliary instruments."

In the Astronomical Department of the Franklin Institute in Philadelphia, there are two fine, modern telescopes, a 10-inch refractor made by Carl Zeiss, and a 24-inch reflector made by J. W. Fecker. These are mounted on the roof of the Franklin Institute building, quite a distance from the Planetarium, and they are in use on every clear night from seven-thirty to ten o'clock.

We are greatly pleased to announce in this connection a gift to the Department of Astronomy of the American Museum of Natural History of an 8-inch equatorial telescope with Brashear object-glass. The telescope was manufactured by Warner and Swasey, who on three different occasions have made what was then the world's largest telescope, and it was used by the late Mr. Worcester Reed Warner in his private observatory at his home, Hillholm, at Tarrytown, New York. The gift of this valuable instrument is made by Mrs. Worcester Reed Warner as a memorial to Mr. Warner. It is especially fitting that we have in the American Museum a memorial to Mr. Warner, because he was one of the only two honorary members of the Amateur Astronomers Association. It is to be regretted that the high surrounding buildings cut down the available sky so much that it is not practicable to install this telescope on the new Planetarium Building. However, it will be placed in a dome on top of the Akeley African Hall or on some other vantage point of the Museum buildings. It is evident that this telescope will be largely used by the people of New York City and vicinity, who are interested in seeing the real objects in the sky. This prophecy is based upon the long lines that have formed on the Museum grounds,—after the meetings of the Amateur Astronomers Association during the past seven years,—awaiting their turns at the portable telescopes lent by Mr. S. B. Grimson, Mr. George A. Galliver, Miss Laura B. Garrett, Mr. C. W. Elmer, Mr. B. T. B. Hyde, Mr. James B. Wyber, Mr. Ramiro Quesada, and others.

In the Planetarium Building, besides the Projection Planetarium, which is obviously the chief attraction, and the large Copernican Planetarium on the floor below, which will be immensely valuable in bridging the conception of the apparent and real motions of the heavenly bodies, there will be many accessory exhibits planned to make the whole astronomical hall a complete and well balanced institution for stirring the imagination and enlightening the mind.

Among these will be the great collection of meteorites belonging to the American Museum. This collection consists of several thousand specimens, representing a few hundred falls. Among them are three brought from Cape York, Greenland, by Peary,—one of these, the Ahnighito, weighing 36½ tons, being the largest meteorite in any museum in the world. There is also the famous Willamette meteorite, weighing 15½ tons, which fell near Portland, Oregon, and which has the unusual deep pits developed after its fall. Several specimens, one weighing a few hundred pounds, have come from the vicinity of Meteor Crater in Arizona.

In short, this is one of the most spectacular collections of meteorites in the world, and it will be installed on the main floor of the Planetarium Building just outside of the Copernican Planetarium. Up to the time when Kirchoff made the principles of spectroscopy available, meteorites furnished our only direct and positive evidence of the constitution of any of the heavenly bodies outside of the earth.

Large transparencies made from the finest astronomical photographs in the world will be shown on the walls of the ambulatory around the Projection Planetarium dome on the second floor, and on the walls of the first floor around the Copernican Planetarium.

Sundials of several types, dial-rings, astrolabes, compasses, hour-glasses, replicas of Galileo's telescopes, and various instruments of historic interest in astronomy will be shown in well lighted cases.

A coelostat, a spectroscope, and a spectrohelioscope, all functioning on clear days, so that the results can be observed by visitors, are included in the plans.

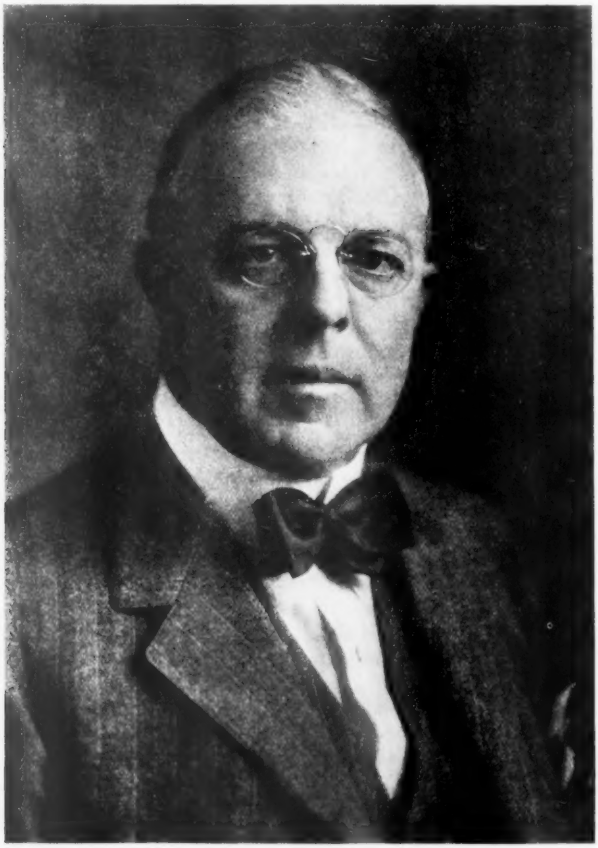
A Ptolemaic planetarium, three or four feet in diameter, illustrating the old earth-centered theory of astronomy, epicycles and all, enclosed in a spherical glass globe, with a crank that may be turned by visitors is included.

A Foucault pendulum to show the rotation of the earth on its axis, and a vortex of water to illustrate the same phenomenon are contemplated.

The modern trend in the interest in astronomy will be shown, not only by transparencies from some of the newer photographs of spiral nebulae or galaxies, but also by a model of a galaxy, and a model to show something of what is known about the distribution of the nearer stars in our own Milky Way Galaxy.

All of the astronomical paintings by Mr. Howard Russell Butler, which are now shown in the Pro-Astronomic Hall, as Professor Henry Fairfield Osborn affectionately referred to it, will be re-installed in the new Planetarium Building. These include the famous triptych of eclipses (1918, 1923, and 1925), and we hope to add Mr. Butler's fourth picture of a total eclipse of the sun, that of 1932. These are, without much doubt, the finest oil-paintings of eclipses ever made. Perhaps as much could be said of Mr. Butler's two paintings of Mars, as well as his other paintings in the hall.

On the outer wall surrounding the Copernican Planetarium, on the first floor, there is planned a zonal oil-painting, representing the zodiac, that belt in the heavens in which the planets are found. This painting will show the mythological figures of the signs of the zodiac and the principal stars of the zodiacal constellations.



MR. CHARLES HAYDEN.
Donor of the Projection and Copernican Planetariums.

To greet the eyes of visitors as they first enter the Planetarium Building, there is planned a large decorative painting in oil, in three panels, illustrating American Indian astronomical mythology. Although primarily from the Blackfeet, the myths selected are those of rather wide distribution with little variation among the various tribes of North

America. The left panel shows the Northern Lights or Aurora Borealis in the form of an arch in all the delicate colors, in which may be dimly seen the figures of the White Men of the North dancing around their camp-fires. The central panel shows the sun-god on a brilliant yellow background, the moon-goddess on a paler background, while in the upper right may be seen the Pleiades as conceived by the Indians, and in the upper left the Big Dipper and the North Star, these corner representations with the Milky Way or sky-trail between them are shown in silver on a background of deep blue. In the lower left corner is represented the story of the creation of the earth by the Old Man. On the right panel is seen a symbolic Thunder-bird in the clouds with the conventionalized zig-zag lightning striking from the cloud to the earth.

The Planetarium Building has been made possible by a loan from the Reconstruction Finance Corporation, while the instruments, both the Projection Planetarium and the Copernican Planetarium, are the gift of Mr. Charles Hayden of New York City for whose generosity a multitude of persons will be sincerely grateful.

NEW YORK CITY, APRIL 1, 1934.

Fragmentary Notes on Astronomy in Japan

By YASUAKI IBA

[*In the preceding issues for March and April, the readers of this magazine have had the opportunity of coming into close touch with accounts of early astronomical events as they are recorded in Chinese literature. The long time interval included in these accounts makes the records of the occidental civilization seem quite recent by comparison.*

We are fortunate in having at hand similar material from another of the oriental countries, as indicated by the above title. These "notes," though fragmentary, are, nevertheless, quite extensive. We shall not have space to present them completely in this issue, but shall continue them from time to time as opportunity is afforded in succeeding issues. The "notes" begin with a listing of first records in the various astronomical fields. This first installment will be limited to these. In places Mr. Iba's phrasing is not quite that which an Englishman might use, but, where the meaning is clear, we have refrained from making any change, believing that the interest in these "notes" will be increased rather than lessened thereby. ED.]

FOREWORD

With belief that it may be of some interest to those in foreign lands to describe astronomical events in the olden days in the Island Empire of "Rising Sun" where civilization prospered at the time of Christ, I deem it well to work up and am amazed at my audacity to dare to do so, for I am neither astronomer nor historian, being an amateur with a fanatic zeal for celestial science.

As the heading indicates, this summary is a collection of brief notes and though much condensed I have tried to be sufficiently clear for the purpose intended.

This is not a total review, for many of the items have been abbreviated lest it become too lengthy; and whilst effort has been made to array all manuscripts according to the priority of the age and also to avoid repetitions, some may not be in order, for which the author makes apology.

In this connection I am under great obligation to Mr. Shigeru Kanda, Sn. Astronomer at Tokio Astronomical Observatory, for much helpful criticism and also for kind permission to use many data from files of his research. Furthermore I wish to express appreciation to my colleague, Mr. Susumu Imoto, for his strenuous effort in collecting many data and whose valuable assistance has made this publication possible.

The writer also has to tender his best thanks to Dr. Joe Ueta, Senior Professor in the Astronomical Faculty of Kioto Imperial University, for very worthy comment and correction.

SUMMARIZED REVIEW ON THE STATUS QUO IN THE OLD STAGE

The founder of Japanese Empire, Jinmu Tenno stipulated various acts on his ascension to the throne, in 600 B.C. in which calendar was also systematised.

At the beginning of Third Century Korean Expedition was carried out with great success by Chuai Tenno (The Fourteenth Emperor) and later succeeded by His Majesty's Consort Jingo Kogo (Kogo = H.I.M. The Empress) and since that time forth three kingdoms then existed in Korean Peninsula and totally conquered were placed under obligation to make annual tributes. From the civilization point of view this had brought forth a great benefit in the advancement in all lines.

At the end of the Third Century a Scientist Dr. Wani by name was sent out from Kudara, one of the three kingdoms in Korea, with various tributes, scientifically important of which was the Standard Text Book of Chinese Characters, and thenceforth an accurate recording work was made practicable. Ere to this, "Kataribe System" was enforced, by which historical events were all conveyed viva-voce through posterity.

Whilst the Thirty-third Emperor (Suiko Tenno) was in the reign (593 to 628) a Buddhist Priest called Kanroku came from Kudara in 602 and dedicated books relating to Calendar and Astrology. In 604, hour system was regulated, by which a day was divided into 12 hours, beginning from midnight which was called "Ne"—(Abbrev' of Nezumi = Rat) and following the order of "Oriental Zodiacal Signs."

The Zodiacal Signs were the following:

Ne	Rat	Ushi	Bull
Tora	Tiger	U	Rabbit
Tatsu	Dragon	Mi	Snake
Uma	Horse	Hitsuji	Sheep
Saru	Monkey	Tori	Cock
Inu	Dog	Yi	Wild Boar

In the ancient stage counting was worked out by means of Bamboo sticks. (According to Dr. J. Ueta wooden sticks were used.) In the medieval stage abacus came into use. All mathematical calculation was operated by this machine, inclusive of astronomical computation.

Oldest Astronomical Record

According to "Mizukagami" (one of the renowned historical literatures) there are three records, two of which, however, are said to be not identified.

In a paragraph relating to 8th Moon 15th year of Suinin Tenno (H.I.M. The Emperor. The Eleventh) *i.e.* 15 B.C., a column, though brief, is found which says:

> ". . . witnessed stars falling like a shower and were very miserable indeed, etc., etc."

The First Influx of Calendar

According to Vol. 19 "Nihon Shoki," in the 14th year of the 29th Emperor Kinmei (*i.e.* 6th Moon, 553) Kudara, one of the three kingdoms then existing in Korea, sent Medical, Astrological, and Calendar experts in turn by injunct of His Majesty to bring over literatures pertaining thereto.

The first astronomer and astrologist, Oh Ho Son, and Oh Doh Ryo, had come in that consequence, in the following year, *i.e.* 554. This is said to be the first influx of Korean Calendar which was of Chinese origin.

The Oldest Comet Recorded

According to Vol. No. 23 "Nihon Shoki," in the 6th year of the reign of Emperor Jomei (*i.e.* 634 A.D.) the apparition of comet was witnessed. It says:

> "In 8th Moon observed a long star in the south and it was called Comet."

Another apparition was reported in 635.

Record of Fireball

In the Vol. 23 "Nihon Shoki," relating to The 34th Emperor Jomei, there is a paragraph which says:

> "In 2nd Moon 637, a big star shot westward from East, with a rattling sound like a thunder. The contemporaneous called it the sound of meteorite and ascribed it for the clamour of the earth," Etc.

The First Strange Star Reported

In the year of ascension of Emperor Kokyoku, *i.e.* 642, a strange star was observed, and report says:

> "On 9th, 7th Moon, a strange star was occulted by the moon."

Oldest Astronomical Staff

The Statute legislated by The Forty-second Monmu Tenno, (697 to 707) which was called "Taiho Ritsuryo" provided to man the Astro-

nomical Observatory with a staff consisting of the following:

Astrological Professor	1
Apprentices	10
Astronomical Professor	1
Apprentices	10
Almanac Professor	1
Apprentices	10
Mathematical Professor	1
Apprentices	30
Horological Professors (Water clock was time piece)	2
Apprentice Observers	20

and in all 400 were accommodated in that Institute.

The Oldest Record of Meteorite

According to Vol. 25 "Shoku Nihongi," relating to Junnin Tenno, on 8th, 9th Moon 764, a huge meteorite, as big as a water-pot, fell onto the roof of bed chamber of Oshikatsu Yemi (influential aristocrat of the time).

The Total Number of Comets Recorded

Mr. Shigeru Kanda says in his famous work "The Comet": "On looking through a book called 'Nihon Saiishi,' edited by Mr. Hateshi Kogashima,—(Records of Disasters and Catastrophes in Japan)—in which 114 comets are tabulated, beginning 634 and ending 1885, with detailed accounts for sources of origin and calendar month both lunar and solar, he could pick out about a dozen of new ones in addition to his data, hence total aggregate up to the end of 16th Century exceeds 130." (His newly commenced research work is still pending, and more than 155 have been depicted thus far for that period.)

Of the above mentioned comets Prof. Dr. Kiyotsugu Hirayama, of Tokio Imperial University identified Halley's Comet; and Dr. S. Ogura, Astronomer in the Hydrographic Bureau of I. J. Navy, computed the orbit of comets witnessed in 1132 and 1240 through the records.

By the way a brief mention must be made of the superstition pertaining to the apparition of the comets. Similarly like in Europe and Asia, a great sensation was aroused in the event of comet apparition in these days. On such occasion astrological experts were alone kept busy.

To cite an instance, there is a paragraph in No. 38 volume Taiheiki (a popular historical narrative) which runs as follows:

> "In 1362 simultaneous apparition of comet and nova (strange star) was observed in the Capital—then Kioto—and contemporaneous Astronomer Royal was summoned to the palace."

Forecasting the omen he alarmed by saying that:

> "As for the nova, it is the fourteenth time since when first appeared in the reign of Emperor Yomei (585 to 587) (this is not verified in the standard historical data) at which time Moriya waged campaign against Buddhist Followers, and of which whilst 2 resulted in good omen, the rest all ended in catastrophes. Regarding Comet since its first apparition in the reign of Emperor Kokyoku (642 to 644) resulting in the rebellion of Iruka Soga that was conquered by the Crown Prince it is the eighty-sixth, none of which passed through without catastrophe, hence every precaution should be observed." This had driven all court-officials to

the consternation and they entertained a terrible fear that the whole world would be dwindled away at any moment, etc.

The Astronomical Annals of Korea

Prior to 1917 nothing of importance was known in this connection, when Dr. Yuji Wada, then Director, Meteorological Observatory of Korean Viceroy Government at Chemulpo, detected many a record preserved intact, and the result of examination on the plentiful data concerning comets was published by Dr. Rikichi Sekiguchi (now in Tokio Central Meteorological Observatory, and the authority in solar physics) in succession, *viz*:

Reports on Ancient Records of Observation.
Published July, 1917.
No. 8 and 9 Astronomical Herald 10th Volume (of Japan Astronomical Society)
Re observation records of Ri Dynasty.
Annual Report 1918 of Korean Government.
Re observation records of Ri Dynasty.

In these reports records were tabulated in accordance with the age and almost identified with the lists enumerated in G. F. Chambers' work, "Handbook of Astronomy," Oxford 1889.

Dr. R. Sekiguchi's investigation revealed the following tables:

Name of Dynasty	Period	Numbers of comets recorded
Shiragi	49 B.C. to 875 A.D.	32
Kokuri	46 A.D. to 658	8
Kudara	85 to 595	16
Koma	989 to 1392	58
Ri (*i.e.* Korea) 1402	to 1884	103

Of these comets recorded there was double-entry in both Shiragi and Kudara, hence subtracting 2, the total amounts to 215, out of which 63 can not be traced or verified in Chambers' list.

At any rate, records preserved in Korea can be claimed as to play a title role in the research of comet science.

The original data, from which foregoing table was extracted, are said to be:

Sangoku Shiki .....Re Shiragi, Kokuri and Kudara
(The History of three countries)
Koraishi .....Re Koma
(The History of Koma)
Ri Cho Jitsuroku and Shosciin Nikki.....Re Ri Dynasty

During the reign of Ri Dynasty, observation works in astronomy and meteorology were precisely carried out to such extent that they are worthy of international admiration.

The fact that the rainfall-rate recording work pursued in Seoul (Keijo) takes its origin as far back as about 1440, and save a trifling loss within past 140 years full records are in existence, is a marvelous case in the world. How punctually and precisely observation work was undertaken in these days in Korea is self-explanatory in the following paragraph.

Observers had to be subjected to a severe examination prior to their adoption. In day time 2 observers stood on duty and nocturnal watch was divided into 5 sections, each of which succeeded by one observer. Their work included the meteorological also, and had there been any change worth mentioning, the whole staff assembled and if there was agreement that the change was of sufficient importance it had to be reported to the Korean Emperor outright. Should it occur at night a memo was presented to His Majesty, in default of which observer was found guilty.

The observation of a comet, commencing from the day of discovery, *i.e.* 10th of 10th Moon, and ending in the first decade of 1st Moon 1665, was carried out every day, making sketches of change in position, and details of coma, with the exception of 8 days due to weather conditions that frustrated the work.

Tenpen Toroku, (record of anomalous change in the heaven) is another valuable datum. Regarding the discovery of the comets in 1661, 1664, 1668, 1695, 1702, 1723, 1759 (Halley's Comet), which are denoted therein, when comparison of the dates of detection is made with those recorded in Europe, it is said that the difference is not conspicuous: Korean records showing "a few days or 15 days" late in the maximum, (Halley's excluded in this comparison).

Ancient Records Classified

The old astronomical records that have been lately classified by Mr. S. Kanda are as follows:

	15 B.C. to 887 A.D.	
Solar Eclipse	172	
Solar Phenomena	17	
Sun Spots	1	
Planetary	26	
Comets	24	(Of which 3 strange stars)
Miscellaneous	16	
Lunar Eclipses	18	(Of which 4 not reckoned as eclipse)
Lunar Phenomena	14	
Occultation	16	(and its like)
Planet observed in daylight.	19	
Meteors	79	(Of which meteor shower 5, Meteorite 1)
Thus the total amounts to	402	

Under the heading "Solar Phenomena" some are not astronomical, being meteorological dealing with halos, etc.

The Oldest Record for Eclipses

In the section of Suiko Tenno, in the Volume No. 22, "Nihon Shoki," following column is found: "In 3rd Moon in the 36th year of his ascension the sun was totally eclipsed." According to Dr. S. Ogura it is the total eclipse that took place on 10th, April, 628 (Julian Calendar). As regards Lunar Eclipse, it is recorded in the section for Kokyoku Tenno Vol. No. 24 "Nihon Shoki," and Dr. Ogura accounted it for the total Lunar Eclipse that occurred on 8th June, 643 A.D.

The tables of ancient eclipses prepared by him are of interest:

	Solar		Lunar	
628 to 800 A.D.	84	(84)	2	(2)
801 to 1000	86	(77)	18	(16)
1001 to 1200	37	(17)	23	(19)

The figures denote the number of records extracted from Kojiruien, Nihon Shoki, Sandai Jitsuroku and Azumakagami (all of which are historical literatures) and figures in parentheses show the number of times in which eclipses were actually observed.

Tables, supplementary to the above mentioned, have been prepared by Mr. Shigeru Kanda, for 628-887. Dates are converted into Julian Calendar and Oppolzer tables referred to.

When statistically considered these tables in combination with that of Dr. S. Ogura, following result is found:

	Total	A	B	C	D	E	F
Solar	172	47	4	168	54	7	111
Lunar	13	10	0	13	10	2	1

A = Could observe, had not been frustrated by weather conditions.
B = Predicted by almanac of the time.
C = Recorded as observed in the Annals, of which some ought to be chronicled as observed whilst predicted only. This is well surmised from the fact that more than hundred do not conform to the modern computation.
D = Proved to be correct by the computation.
E = Those not total eclipse and/or records doubtful.
F = Records themselves erroneous.

Record of Sunspots

The oldest is that which is given in the 3rd vol., "Montoku Jitsuroku" which says:

"On 6th of 11th Moon, 851, solar disk looked dull with a big black spot like an almond."

Oldest Occultation

In Vol. 23 "Nihon Shoki" there is a clause, "On 7th of 2nd Moon, in the 12th year of Emperor Jomei a star was occulted by the moon" and as the result of laborious calculation on the part of Mr. Kiyohiko Ogawa—Assistant to Mr. S. Kanda—it has been verified that the foregoing was the incident that took place on 4th March (Julian) 640. In detail:

At 9 p.m. (Local time of the capital, then situated in the vicinity of present Nara—one of famous resorts for foreign tourists in present day) III 4, 640, position of the moon, R.A. 49°.9, Decl. N 12°.8, and that of Aldebaran, 49°.9 and N 12°.7 and therefore that the star then occulted was Alpha Tauri may well be accepted. Another possibility that may strike the reader is that of the planet Venus.

In Vol. 10, "Montoku Jitsuroku" there is a paragraph which runs as follows:

"At dawn 28th, 5th Moon, 858—here letters not clearly deciphered—occulted by the moon." This is said to be the occultation of Venus, for elaborate calculation shows the position of Moon and Venus as:

3 a.m. (Local Time of Kioto then the Capital) 12th July (Julian) 858

Moon	75°.3	N 21°.2
Venus	75°.1	N 21°.4

The Origin of the Astronomical College

In the 6th year of Saimei Tenno (*i.e.* 660) then the Crown Prince—afterward Tenchi Tenno—ordered to make "Water Clock," divided 24 hours into 100 sections, so as to indicate the exact time. After his ascension to the throne he established a school devoted to astronomical science and 2 astronomers were commissioned to educate 20 students.

Record of Huge Meteor and Shower

According to Vol. 27 "Nihon Shoki" relating to Tenchi Tenno, there is the following paragraph which says:

> "In third Moon 664, a star shot down to the northern direction of the Capital."
>
> "In 11th Moon 685, a conspicuous meteor shower was witnessed in the vicinity of the capital," says Vol. 29, "Nihon Shoki."

Oldest Astronomical Observatory

In 675, Observatory was establshed at Asuka, Nara Prefecture, when Tenmu Tenno (40th Emperor) was reigning, and site is said to be in the vicinity of where Yagi Meteorological Observatory is at present.

Oldest Record of Star Observed in Daylight

According to Vol. No. 2 "Shoku Nihongi," on 6th, 12th Moon, 702, a star was observed in daylight, and Mr. S. Kanda feels inclined to take it for Venus.

Record of Venus Observed in Daylight

In Vol. 9, "Shoku Nihongi," relating to the reign of Gensho Tenno (44th Emperor) a column is found of the planetary approach, which says:

> "On 10th, 7th Moon, 6th year of Yorow, *i.e.* 722, witnessed Venus in daylight and it approached Jupiter on 28th."

Astronomical Instrument Imported

In 730 (in the reign of 45th Emperor Shomu who had erected that famous "daibutsu" in Nara) the Prime Minister overtured the necessity of bringing up capable successors in the Astronomical Bureau, in recognition of its *sine qua non*, and the apprentices enrolled were given allowance on the same footing with those in the Scientifical Institute.

In 3rd Moon, 735, the Ambassador and students sent to China (Tang) Hironari Tajihi and Mabi Kibi returned home with manifold astronomical instruments, of which "Sokuyei Tetsushaku"—An iron stick of about 8 ft. with which measured shadow of the sun,—and "Dohritsu Kan"—Literally inferring, a pipe, made of copper, through which observed celestial object, like that which is said to have been employed by Hipparchus—can be enumerated.

Astronomical Text to Apprentice

Imperial ordinance issued in the reign of Kohken Tenno (46th Emperor) *i.e.* 757, provided to subsidize Astronomical School, for which extensive estate was alloted. Tuition was given to the students, making

good use of astro text books imported from China and Korea (inclusive of mathematics).

The texts studied by the contemporaneous were:

"Shu Hai" (Highest mathematics of the time).
"Kanshin Jitsurekishi" (Historical review of legislature on astronomy in ancient China).
"Taiyen Rekigi" (Lecture on Taiyen Calendar).
"Kusho" (Mathematical text).
"Rikusho" (do.).
"Jotenron" Etc.

First Record of Canopus

From "Ruishu Kokushi" ancient record on Alpha Argo can be depicted and it is the oldest, which reads as follows:

"Rohjinsei—(Canopus)—was observed on 1st of 11th Moon, 803, and astrologist took it for a good omen, etc."

Until the last quarter of 8th Century the capital of Japan was always in and around Nara, and, the southern sky being barricaded by the range of mountains, it was more than probable that even at its culmination Canopus could not be observed. On the other hand at the time under reference the Capital was removed to Kioto which is with the south horizon open, hence observation became possible.

Ancient Records of Novae (Strange Stars)

"Meigetsuki" which is in reality the diary of the Aristocrat, Sadaiye Fujiwara, offers valuable reference in this line. In 1230, there was an apparition of Nova, and this seemed to have led him to compile a list of strange stars observed in the past.

According to the records contained therein, the apparitions occured in the following years:

877, 891, 930, 1006, 1054, 1166, 1181 A.D. (These are not the total).

Of the above mentioned the fourth which was detected on 2nd of 4th Moon, 1006 was so luminous that the people could see it without any difficulty.

It looked like the moon at its quarter phase.

According to Mr. Shigeru Kanda, the constellation in which apparition occurred was the Lupus and the record was identified in the annals of Chinese origin. He also reveals the fact that this was observed for 10 years in China, witnessed in the East at dawn in November, and dipped under horizon in S. W., in August every year.

That of 1054 appeared in the region of ζ Tauri and was as bright as Jupiter.

The Statistical Number of Astronomical Data in Standard Historical Literatures

Mr. Shigeru Kanda has started research work in astronomical history, in coöperation with Dr. Kiyotsugu Hirayama of Tokio Imperial University, and the following tables have recently been published in "Weekly News of Tokio Imperial University."

Epoch	Approx. No. of Data found
601 — 700 A.D.	30
701 — 800	130
801 — 900	300
901 — 1000	210
1001 — 1100	150
1101 — 1200	370
1201 — 1300	430
1301 — 1400	300
1401 — 1500	320
1501 — 1600	210

Further supplement is expected as the work goes on.

THE CALENDAR REFORMATIONS

Since the foundation of Japanese Empire, calendar had gone through reformation 12 times, as follows:

The Ancient Calendar	A.D.
Genka Calendar	692
Giho Calendar	697
Taien Calendar	764
Goki Calendar	858
Senmei Calendar	862
Daitoh Calendar (was in use for 10 months)	1684
Jokyo Calendar	1684
Horeki Calendar	1754
Kansei Calendar	1797
Tenpo Calendar	1842
Gregorian Calendar	1873

With reference to some of the reformations enacted after Jokyo Calendar, further articles will be written later.

(To be continued.)

The Stereographic Projection of the Sphere*

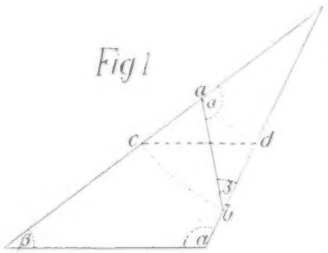
By FREDERIC R. HONEY

Various systems have been devised for the representation of portions of the earth's surface by parallels and meridians, each one offering some special advantage. In his study of astronomy and mathematics the student is sometimes at a loss to visualize the meaning of the stereographic projection. Realizing this, the writer has prepared the accompanying illustrations which are designed to assist him in making a more extended study of this interesting projection.

The stereographic projection, by which the path of an eclipse is clearly shown (see Fig. 3) is adopted for two reasons: first, all circles of the sphere, both parallels and meridians, are represented by circles; and, secondly, angles are preserved, as, for example, the angles between meridians at the poles, which are represented in their true values.

*As an example, see *Nautical Almanac*, 1927 June 29, "A Total Eclipse of the Sun."

The stereographic projection is really a perspective drawing, the point of sight being limited to the surface of the sphere upon which the parallels and meridians are traced. In an ordinary perspective drawing the observer is assumed to be situated on one side of the picture plane, and the object to be delineated on the other side; the picture plane is a vertical plane; and the outline of the object is traced on this plane so that every point and line apparently coincides with the point or line. In the stereographic projection the object, or part of it, may be, and frequently is, on the same side of the picture plane as the observer; that is to say, the stereographic projection conforms to the most *general* definition of a drawing made in accordance with the laws of Linear Perspective.



THE SUBCONTRARY SECTION.

Fig. 1. If an oblique cone with a circular base be intersected by a plane *ab* in such a position that the angles α and β are respectively equal to α and β at the base, it may be shown analytically that the section *ab* is a circle; that is to say, it is the same section as would be obtained by an intersecting plane *cd* parallel to the base; and is known as a *subcontrary section*.

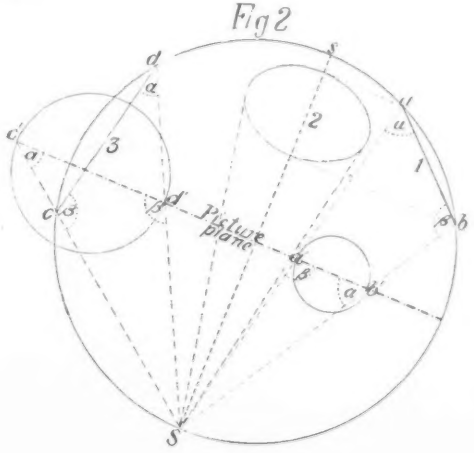
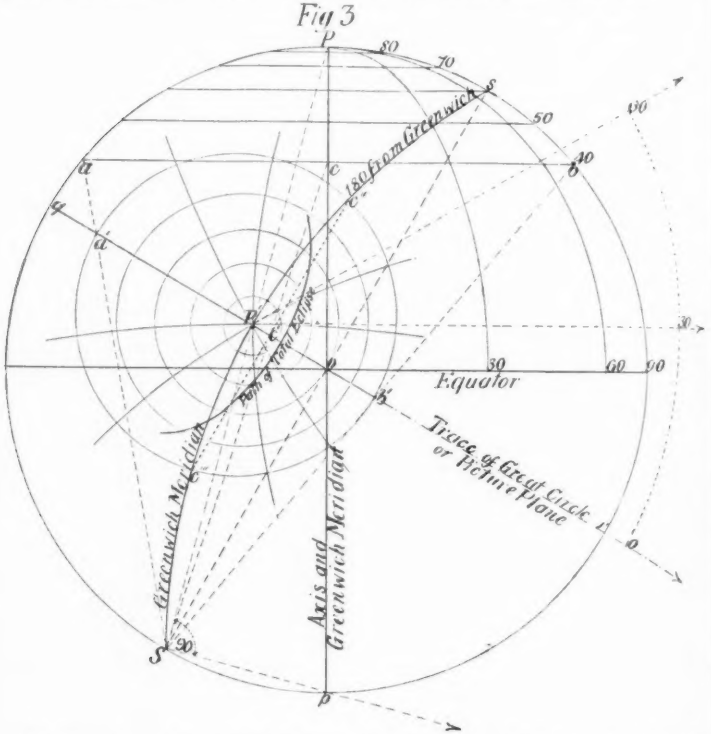


Fig. 2. The sphere is represented by a great circle; and the point of sight S is assumed anywhere on its circumference. The diameter Ss is an axis of the sphere, perpendicular to which the trace of the plane of a great circle, or picture plane, is drawn. The chord ab *No. 1* is the projection of a circle whose plane is perpendicular to the plane of projection. The visual rays Sa and Sb pierce the picture plane respectively at a' and b'. The triangles Sab and $Sb'a'$ are similar because in each case the angle is measured by one-half the sum of the subtending equal arcs, that is the angles Sab and $Sb'a'$ are equal $(a = a)$. The section $a'b'$ is therefore a subcontrary section of the cone Sab, and is a circle.

Fig 3



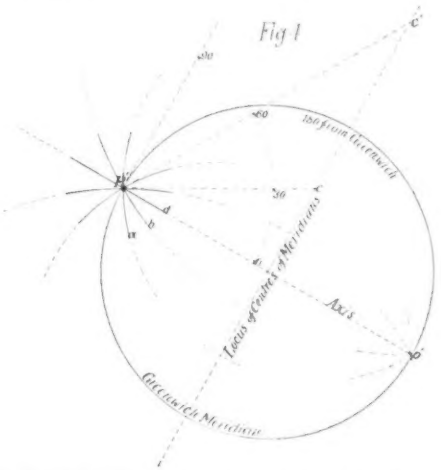
If the sphere be rotated about the axis Ss until the circle takes the position projected on an ellipse *No. 2*, it will be evident that the position of this circle relative to the point of sight is such that the section is the same as in *No. 1*; and that in this, or into whatever position the sphere be rotated, the perspective will be a circle, but in a different position on the picture plane.

The projection of the circle in *No. 3* is the chord cd, partly on the same side of the picture plane as the point of sight. The triangles Scd

and $Sd'c'$ are similar because the angles a are measured by one half of the difference of the equal arcs; and the perspective $c'd'$, which is a subcontrary section, is also a circle.

STEREOGRAPHIC PROJECTIONS OF PARALLELS AND MERIDIANS

Fig. 3 is the projection of the earth on the plane of a meridian 90° from Greenwich. It represents the earth's axis, the equator, parallels of the northern hemisphere from 40° to 80°, the meridian of Greenwich, and those of 30°, 60°, and 90° from Greenwich.



The point of sight is assumed at a distance of 30° from the south pole p; and the trace of the plane of a great circle, or picture plane qr is drawn perpendicular to Ss, the axis of the great circle, on whose plane the stereographic projections are constructed.

To draw the projection of a parallel as for example that of 40°: the visual ray Sa pierces the picture plane at a', and Sb pierces it at b', and $a'b'$ is the diameter of the circle. The diameter of the circles representing the parallels from 50° - 80° are obtained in the same way. If the picture plane be rotated about its trace until it comes into coincidence with the plane of this page, the circles are shown in their relative positions.

The perspective of the north pole P is at P' where the visual ray SP pierces the picture plane. To determine the great circle which includes the meridian of Greenwich and that which is 180° from Greenwich, the visual ray Sc pierces the picture plane at c'. The double ordinate through c' gives the points c'' and c''' on the circumference of the circle which represents the parallel of 40°. An arc of a circle passing through c'', P', and c''' whose centre is on qr produced beyond the limits of the page, represents a part of this great circle. The visual ray Sp through the

south pole intersects qr produced at a point p' beyond the limits of the page; and $P'p'$ is the diameter of the circle whose circumference is the projection.

Fig. 4. In order to bring the construction within the limits of the page, the scale is reduced. The great circle, which is described on $P'p'$ as a diameter, represents the Greenwich meridian, and that which is 180° from Greenwich. Since all meridians pass through the poles, the locus of the centres is cc' perpendicular to the axis. And, since the angles between meridians at P' are shown in their true value, their centres are found as follows: the radius $P'c$ of the meridian a which forms an angle of 30° with that of Greenwich, is drawn at this angle with the axis, and the centre is at c. Similarly the radius $P'c'$ at an angle of 60° determines c' the centre of the meridian which is inclined at 60° with that of Greenwich. The radius of the 90° meridian is infinitely long, and the meridian d is therefore a straight line. The centres of all meridians are on $c'c$ produced on both sides of $P'p'$; and the remainder of the work is symmetrical with respect to the axis.

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Planet Notes for June, 1934

By CLIFFORD E. SMITH

The *Sun* will be moving from the central part of Taurus to the central part of Gemini. On June 21 at $8^h\,48^m$ P.M., C.S.T., the sun will be at the summer solstice. This event marks the beginning of spring in the northern hemisphere. The distance of the earth from the sun at the beginning of this period will be about 94.1 million miles, and this distance will increase about 340,000 miles during this period. The position of the sun on the first and last days of the month will be, respectively: R.A. $4^h\,33^m$, Decl. +21° 56′; and R.A. $6^h\,33^m$, Decl. +23° 14′.

The phenomena of the *Moon* will occur as follows:

Last Quarter	June	4 at	7 A.M.	C.S.T.
New Moon		11 "	8 P.M.	"
First Quarter		20 "	1 A.M.	"
Full Moon		26 "	11 P.M.	"
Apogee		15 "	4 A.M.	"
Perigee		27 "	7 P.M.	"

Mercury will be moving from the western to the eastern part of the constellation of Gemini. The distance of Mercury from the earth will be about 100 million miles at the beginning of the month, and this distance will decrease about 40 million miles during the period; the corresponding change in apparent diameter will be from about 6 to about 11 seconds of arc, respectively. Mercury will be an evening star setting somewhat more than an hour after the sun. During the middle of the month it will actually set about an hour and forty minutes after the sun, since greatest elongation east will occur on June 14 at 1:00 A.M., C.S.T. (24° 27′). Conjunction with the moon will occur also on June 14 at 1:00 A.M., C.S.T. (Mercury 1°.0 S). The position of Mercury on the first and last days of the month will be, respectively: R.A. $5^h\,57^m$, Decl. +25° 38′; and R.A. $7^h\,41^m$, Decl. +18° 49′.

Venus will continue as a morning star, moving from the southern part of Aries to the western part of Taurus, and it will rise about 2½ hours before the sun. Its distance from the earth will be about 100 million miles, and its apparent diameter will be about 15 seconds of arc. On June 1 at 11:00 A.M., C.S.T., Venus will be in conjunction with Uranus (Venus 1°.7 S), and on June 8 at 2:00 P.M., C.S.T., it will be in conjunction with the moon (Venus 7°.7 S).

Mars will be in Taurus and thus will rise about an hour before the sun. Since it is so near the sun in apparent position, it will not be of much interest during this period.

Jupiter will be an evening object in central Virgo, and, during the middle of the month, it will be on the meridian about 7:00 P.M., Standard Time. Its distance from the earth will be about 480 million miles and its apparent diameter will be about 37 seconds of arc. Conjunction with the moon will occur on June 21 at 10:00 A.M., C.S.T. (Jupiter 6°.6 N).

Saturn will be a morning object in eastern Capricornus, rising some two hours or so before the sun. Its distance from the earth during this period will be about 480 million miles, and its apparent diameter will be about 16 seconds of arc. On June 3 at 7:00 A.M., the moon will be in conjunction with Saturn (Saturn 3°.0 S); a second conjunction with the moon will occur on June 30 at 2:00 P.M., C.S.T. (Saturn 3°.2 S).

Uranus will be a morning object in Pisces, and during the middle of the month it will rise about 2:00 A.M., Standard Time. Its distance from the earth will be about 1,900 million miles, and its apparent diameter will be about 3½ seconds of arc. On June 1 it will be in conjunction with Venus as has been mentioned under the notes on Venus, and on June 7 at 11:00 P.M., C.S.T., it will be in conjunction with the moon (Uranus 5°.9 S). The position of Uranus on June 16 will be R.A. 1^h 54^m, Decl. +11° 7′.

Neptune will be an evening object in Leo setting about five hours after the sun. Its distance from the earth will be about 2800 million miles, and its apparent diameter will be about 2½ seconds of arc. Conjunction with the moon will occur on June 18 at 3:00 P.M., C.S.T. (Neptune 3°.8 N). The position of Neptune on June 16 will be R.A. 10^h 47^m, Decl. +8° 44′.

OCCULTATION PREDICTIONS

(Taken from the *American Ephemeris.*)

Occultations Visible in Longitude +72° 30′, Latitude +42° 30′.

Date 1934		Star	Mag.	Immersion: Greenwich C.T. h m	Immersion: a m	Immersion: b m	Immersion: Angle E from N °	Emersion: Greenwich C.T. h m	Emersion: a m	Emersion: b m	Emersion: Angle E from N °
June	1	329 B.Sgr	6.1	6 4.5	−1.5	+1.5	48	7 14.9	−1.9	+0.4	274
	1	336 B.Sgr	6.5	7 19.0	−1.6	+0.9	59	8 35.2	−1.8	+0.1	256
	2	θ Cap	4.2	9 24.7	−1.1	+0.9	38	10 35.1	−1.7	−0.3	257
	20	431 B.Leo	6.2	0 3.4	−1.2	−1.8	136	1 20.7	−1.3	−1.9	298

Occultations Visible in Longitude +91° 0′, Latitude +40° 0′.

June	1	329 B.Sgr	6.1	5 35.5	−1.1	+1.8	57	6 41.8	−1.3	+0.9	276
	1	336 B.Sgr	6.5	6 46.8	−1.5	+1.6	56	7 59.6	−1.8	+0.6	269
	2	θ Cap	4.2	9 1.1	−1.0	+2.1	15	9 56.0	−2.6	−0.3	287
	9	ε Ari	4.6	9 2.1	+0.2	+1.0	102	9 45.9	+0.5	+2.0	213
	26	95 G.Oph	6.1	1 37.9	−1.6	+1.9	62	2 32.3	−0.7	−0.2	318
	26	43 Oph	5.4	9 5.6	−1.8	−1.1	110	8 9.2	−0.8	−0.3	237

Occultations Visible in Longitude +120° 0′, Latitude +36° 0′.

June	2	θ Cap	4.2	8	19.0	−1.2	+3.5	7	8	51.5	−1.1	−0.4	312
	4	252 B.Aqr	5.8	10	3.5	−0.8	+2.0	51	11	13.3	−1.3	+1.6	244
	4	197 G.Aqr	6.3	11	16.6	−1.6	+1.4	80	12	23.8	−1.0	+2.2	207
	21	q Vir	5.3	6	7.4	−1.0	−1.9	126	7	17.0	−0.7	−1.8	290
	25	65 B.Sco	5.5	1	49.5	−1.0	+1.3	85	2	48.7	−0.5	−0.2	314
	26	43 Oph	5.4	6	10.4	−1.9	0.0	110	7	27.3	+2.1	+0.2	255

The quantities in the columns *a* and *b* are given for the purpose of making these predictions useful for any place within 200 miles of the point indicated. The procedure is as follows: Subtract the longitude of the point given from the longitude of the place in question; multiply the result, taking the signs into account, by the quantity under *a* for the star to be observed; similarly, with the latitude, using *b*; apply the sum of the products, with its proper sign, to the Greenwich C.T., and obtain the predicted Greenwich Civil Time for the phenomenon at the place of observation. To obtain Eastern Standard Time it is necessary to subtract five hours; Central Standard Time, six hours, etc.

Comet Notes

By G. VAN BIESBROECK

Comet 1934 *a* (Jackson). A telegram dated March 28 announced the discovery of the first new comet of this year at the Union Observatory at Johannesburg, South Africa. The discoverer, Cyril Jackson, sent the following position:

1934 March 27.9033 U.T.
R.A. $13^h\ 18^m\ 12^s$, Decl. −27° 10′.

He described the object as diffuse and gave the magnitude as 12. The daily motion was $1^m\ 36^s$ west and 24′ south. Cloudy weather and moonlit sky prevented the writer from looking for the object until April 6 but it could not be found at that time. The uncertainty of the position ten days after the discovery and the far southern declination probably account for this failure. However, no further information has been obtained concerning this comet which remains so far unconfirmed.

As to the previously announced comets, they are all very faint and can be reached only with powerful instruments. Periodic Comet 1925 II (Schwassmann-Wachmann) has steadily lost in brightness since its exceptional behavior in March (see p. 218). In the beginning of April the diameter had expanded to 50″ and there was no longer any marked condensation in the coma. On April 17 the brightness had fallen to 15M and the coma could not be seen over a diameter of more than 30″. It will be well worth while to keep watch on this remarkable object for possible new outbursts of light. The ephemeris computed by J. G. Behrens is continued here:

Ephemeris of Comet 1925 II.

1934	α	δ
0^h U.T.	h m	° ′
May 3	10 1.6	+9 18
11	2.0	9 15
19	2.9	9 9
27	4.3	9 0
June 4	6.3	8 49
12	10 8.7	+8 35

Comet 1932 *g* (Geddes) remains in good position for observation in Ursa

Major, as shown by the following continuation of the ephemeris which I computed from Bobone's elements (see p. 143):

EPHEMERIS OF COMET GEDDES.

1934 0^h U.T.	α h m s	δ ° ′	M
May 3	11 28 4	+64 37	15.7
11	19 55	64 8	.8
19	13 38	63 33	.9
27	9 7	62 54	15.9
June 4	6 13	62 14	16.0
12	4 44	61 32	.1
20	4 32	60 51	.1
28	5 21	60 11	.2
July 6	7 6	59 32	.2
14	9 40	58 56	.3
22	12 45	58 24	.4
30	11 16 39	+57 54	16.4

The correction of the ephemeris was $+0^m4$ and $+4'$ on April 13 at which date the writer estimated the brightness as equivalent to that of a star of magnitude 16. It seems now probable that the observations, which extend over a period of 22 months already, will be possible over a duration of fully two years.

COMET 1933 *f* (WHIPPLE) does not seem to have been observed after March 19. It was evidently too faint to be followed further in the evening sky. A. D. Maxwell communicates a new set of elements depending on the long arc covered by positions on 1933 October 15, December 14, and 1934 March 5:

ELEMENTS OF COMET 1933 *f* (WHIPPLE).

Perihelion	= 1933 July 31.5519 U.T.	
Node to Perihelion	= 190° 15′ 26″.9	}
Node	= 188 34 8.6	} 1933.0
Inclination	= 10 12 58.3	}
Eccentricity	= 0.349173	
Major axis	= 3.832573 Astr. units	
Period	= 7.503 years	

From these data he computes an ephemeris for next fall when the comet becomes a morning object. It reaches its next opposition on January 30, 1935, but it will then be extremely faint.

Williams Bay, Wisconsin, April 21, 1934.

Variable Stars

Monthly Report of the American Association of Variable Star Observers for March, 1934

We welcome an initial report from Mr. L. Donald Koons of Waverly, New York. Dr. C. L. Hess of Bay City, Michigan, visited the Association headquarters late in March. President E. W. Brown is spending a few months in England. Dr. Dirk Brouwer of Yale University, New Haven, Connecticut, is the recently appointed chairman of the Occultation Committee to whom all communications concerning the work of this committee should be directed. Secretary W. Tyler Olcott has gone to Useppa Isle, Florida, having spent several months in Miami training prospective members in the art of variable star observing. The Godfrey Club of Watertown, Wisconsin, has been obliged to disband. Some of the individual mem-

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

Jan. 0 = J.D. 2427438; Feb. 0 = J.D. 2427469; March 0 = J.D. 2427497.

J.D.Est.Obs.

V Scl
000330
456[13.3 En
476[13.3 Bl

S Scl
001032
440 9.7 Bl
447 9.7 Fn
450 10.5 Bl
456 10.2 En
460 10.7 Bl
465 10.7 Bl
468 10.5 Ht
473 10.8 Ht
475 11.0 Bl
484 11.3 Bl
488 11.3 Bl

X And
001046
448 12.8 Bm
455 12.5 Bm
462 12.0 Bm
471 11.6 Ch
471 11.3 Jo
475 10.6 Jo
477 10.3 Jo
481 10.2 Jo
485 10.0 Jo
487 9.3 Jo
488 9.6 Ch
490 9.3 Jo
502 9.0 GC
502 8.8 Jo
506 8.4 Jo
509 8.5 Jo
512 8.2 Jo

T And
001726
448 11.2 Ch
471 9.3 Ch
471 9.9 Jo
475 9.6 Jo
477 9.5 Jo
479 9.6 Jo
479 9.2 Hi
480 9.0 Ch
481 9.5 Hf
485 8.6 Jo
489 8.3 Ch
490 8.1 Jo
500 8.5 Pt

T Cas
001755
471 11.8 Ch
475 11.9 Jo
478 11.9 Ra
479 11.7 Jo
481 11.5 Pk
483 11.5 Wd

T Cas
001755
484 11.8 B
485 11.7 Jo
488 11.6 Ch
502 11.5 Jo
503 11.1 My
503 11.5 So
504 11.0 Jo
506 11.1 Jo
509 10.8 Jo
509 9.5 Mc
509 11.0 Wd
510 10.8 My
510 11.3 Pt
512 10.6 Jo

R And
001838
471 11.8 Jo
472 12.0 Ch
472 12.7 Mg
476 11.5 Jo
480 11.6 L
481 11.5 Jo
483 11.8 Ah
485 11.3 Jo
486 11.6 Hf
486 11.8 Wd
488 11.6 Ch
504 11.5 Jo
506 11.5 Jo

S Tuc
001862
426 12.5 Sl
440 11.0 Bl
445 10.9 En
450 10.5 Bl
456 10.6 En
460 10.5 Bl
465 10.3 Bl
475 10.7 Bl
479 10.3 Ht
484 10.5 Bl
488 10.5 Bl
490 10.6 Ht
494 10.8 Bl
495 11.0 Ht

S Cet
001909
471 12.8 Ch

T Scl
002438a
447 9.2 En
456 9.7 En

T Phe
002546
450[13.6 Bl
456[13.0 En

T Phe
002546
473[13.0 Ht
476 13.5 Bl
484 13.3 Bl
488 12.6 Bl
494 12.3 Bl

W Scl
002833
447 13.0 En
450 13.0 Bl
456 13.0 En
476 12.9 Bl

Y Cep
003179
449 12.0 Ch
482 9.5 Ch
486 9.7 Jo
487 9.8 Jo
490 9.9 Jo
502 10.5 Jo
504 10.3 Jo
506 10.5 Jo
509 10.5 Jo
512 10.5 Jo

U Cas
004047a
457 9.0 Kn
462 8.8 Kn
471 8.0 Jo
471 7.8 Ch
472 8.3 Pf
475 8.4 Hi
477 7.7 Jo
478 8.1 Ra
479 8.4 Hi
480 8.3 Pf
481 8.1 Jo
481 8.2 Hf
481 8.4 Sx
485 7.7 Jo
486 8.5 Kn
487 8.0 Jo
487 8.5 Wd
490 8.3 Jo
496 8.5 Hf
496 8.6 Wd
496 8.4 Ah
496 8.7 Hi
499 8.7 Md
500 8.3 Pt
502 8.7 Ah
504 8.6 Ah
506 8.6 Ah
508 9.3 Md
509 8.9 Wd
509 8.6 Ah
512 8.5 Ah

RW And
004132
471[13.5 Ch
482[13.5 B

V And
004435
462 13.6 Bm
471 13.1 Ch
480 12.2 L
484 11.9 B
502 11.4 GC

X Scl
004435
450[13.6 Bl
476[13.6 Bl

RR And
004533
448 14.5 Bm
455 15.0 Bm
472[14.2 Mg
480[13.3 L

RV Cas
004746a
471 12.6 Ch
472 13.0 Pf
480 13.2 Pf
500[12.1 Pt

— Cas
004746b
472 11.1 Pf
480 11.5 Pf

W Cas
004958
471 10.0 Ch
475 9.5 Jo
477 9.2 Jo
478 9.7 Ra
481 9.5 Jo
483 9.7 Wd
485 9.4 Jo
487 9.4 Jo
489 9.9 Wd
490 9.3 Jo
496 10.1 Hf
496 9.8 Wd
500 9.9 Pt
502 9.3 Ah
503 9.6 My
503 10.0 So
504 9.2 Ah
505 9.1 Fd
506 9.4 Jo
509 9.3 Jo
509 9.7 Wd
510 9.6 My
512 9.1 Jo

U Tuc
005475
426 11.6 Sl

U Tuc
005475
431 11.2 Sl
440 10.7 Bl
445 10.8 En
447 10.5 En
450 10.4 Bl
455 10.1 En
460 9.8 Bl
465 9.1 Bl
473 8.7 Ht
475 8.5 Bl
479 8.8 Ht
484 8.7 Bl
488 8.6 Bl
490 8.6 Ht
495 8.9 Ht
495 8.8 Bl

Z Cet
010102
471 11.2 Hi
473 11.8 Ch
480 11.8 Hi
482 11.8 L

U Scl
010630
440 9.8 Bl
450 10.0 Bl
460 10.7 Bl
465 10.9 Bl
475 10.9 Bl
484 11.0 Bl
488 11.5 Bl
495 11.6 Bl

U And
010940
472 11.9 Mg
473 11.8 Ch
480 12.0 L

UZ And
011041
473[13.6 Ch
480[14.0 L

S Psc
011208
482 13.0 L
484 12.8 B

S Cas
011272
442 11.8 Ch
479 12.6 Ch
482 12.5 B
482 12.7 Fd
503 12.6 Ra
503 12.8 My
505 13.2 Fd
510 12.8 My

U Psc
011712
472 11.7 Mg
473 11.7 Ch
482 11.9 L

RZ Per
012350
473 11.8 Ch
503[12.0 B

R Psc
012502
448 12.4 Bm
455 12.4 Bm
462 12.5 Bm
473 13.0 Ch
482 13.4 L

RU And
013238
472 10.8 Mg
473 11.1 Ch
475 11.0 Cy
480 10.8 L
484 10.7 B
500 10.5 Pt

Y And
013338
472 12.7 Mg
473 12.8 Ch
475 12.6 Cy
482 13.5 B
500[11.5 Pt

X Cas
014958
470 10.7 Bn
475 10.7 Jo
476 10.7 Bn
477 10.5 Jo
480 10.6 Bn
481 10.4 Jo
485 10.3 Jo
485 10.6 Bn
486 11.0 So
487 10.0 Jo
489 10.6 Bn
500 12.0 Pt
502 10.5 Jo
503 11.0 So
504 10.4 Jo
505 10.2 Fd
505 10.2 B
506 10.8 Jo
512 10.6 Jo

U Per
015254
471 11.4 Ry
473 11.1 Ch
475 11.3 Cy
478 11.1 Ry
482 10.9 B

Variable Star Observations Received During March, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
U Per	T Per	o Cet	S Per	U Cet	W Per
015254	021258	*021403*	021558	*022813*	024356
482 10.9 Ry	472 8.6 Sq	478 3.9 Pf	500 9.7 Pt	480 11.8 Ch	500 9.3 Pt
482 11.0 Fd	478 8.7 Ra	479 4.2 Se	502 10.4 Hf	481 12.3 Jo	500 9.6 Mc
486 10.8 So	481 9.4 Sx	479 4.0 Jo	503 9.9 So	482 11.6 L	502 9.2 Jo
496 10.4 Hf	481 8.9 Hf	479 4.0 Ko	503 9.6 My	RR Cep	502 9.4 Hf
496 10.1 Ry	483 9.1 Wd	480 4.0 Pf	503 10.3 Ah	022980	503 9.4 My
496 10.3 Wd	483 8.7 Sq	480 4.1 Ch	503 10.1 SR	477 10.8 Ch	503 9.7 So
500 10.5 Pt	487 8.8 Jo	481 4.3 Hf	505 10.1 Sx	480 10.8 Br	504 9.2 Jo
503 9.9 So	500 9.2 Pt	481 3.5 Sx	506 9.9 Jo	486 10.7 Br	509 9.4 Jo
503 10.4 My	502 8.8 Hf	482 4.0 Rb	507 10.1 Wd	R Tri	510 9.6 Mc
503 9.8 Jo	503 8.8 Jo	482 4.3 Se	509 9.9 Wd	023133	510 9.7 My
504 9.6 Jo	504 9.0 Sx	482 3.9 Ah	509 10.0 Jo	472 11.6 Ch	512 9.2 Jo
506 9.5 Jo	506 8.8 Jo	482 4.2 Ra	510 10.3 SR	482 11.3 Ch	R Hor
509 9.6 Jo	507 9.3 Wd	482 3.8 L	511 9.7 My	482 11.5 B	*025050*
510 10.0 My	509 9.4 Wd	483 3.8 Wd	512 10.2 Jo	482 11.2 Ah	426 11.3 Sl
510 10.0 Mc	512 8.7 Jo	483 3.9 Ah	512 10.2 SR	483 10.6 Ah	431 11.2 Sl
512 9.4 Jo	Z Cep	484 4.5 Mn	R Cet	483 11.1 Wd	440 11.4 Bl
XX Per	021281	485 4.2 Rb	*023000*	485 10.8 Gy	447 12.2 En
015654	480[14.4 Br	485 4.0 Pf	472 11.0 Ch	500 11.3 Pt	450 12.2 Bl
473 8.2 Ch	491[13.5 Br	486 4.0 Jo	475 10.6 Cy	500 11.0 Ra	460 12.3 Bl
UV Per	o Cet	486 4.1 Hf	479 10.5 Hi	502 9.8 Jo	465 12.3 Bl
020356	*021403*	486 4.1 Rb	482 10.2 L	506 9.6 Jo	473 12.8 Ht
472[13.9 Br	441 5.4 Ch	486 4.4 Se	486 9.2 Jo	509 9.7 Jo	475 12.5 Bl
478[13.9 Br	445 5.0 En	486 4.0 Wd	486 9.7 Hf	509 10.0 Wd	479 12.9 Ht
480[13.9 Br	447 4.8 En	488 4.1 Ch	486 9.7 Wd	512 9.6 Jo	484 12.5 Bl
482[12.7 Br	447 5.0 Ch	489 4.0 Pf	489 8.9 Ch	T Ari	488 12.6 Bl
486[13.7 Br	452 4.5 Ch	492 4.8 Mn	490 9.0 Jo	024217	490 13.0 Ht
491[13.7 Br	455 4.4 Ch	493 4.2 Ch	496 8.9 Hi	473 8.2 Ch	495 12.7 Bl
R Ari	456 3.8 En	496 4.4 Ra	504 8.0 Jo	476 8.0 Jo	T Hor
021024	458 4.3 Ch	496 4.1 Rb	506 7.7 Jo	479 8.3 Jo	*025751*
471 8.5 Jo	459 4.3 Cy	500 3.9 Pt	509 7.7 Jo	481 8.1 Jo	426 8.0 Sl
471 8.2 Ch	461 4.2 Cy	501 4.7 Ah	512 7.6 Jo	485 8.5 Jo	431 8.1 Sl
471 8.5 Ah	461 4.2 Ch	502 4.6 Ah	RR Per	487 8.7 Jo	440 9.4 Bl
475 8.5 Jo	462 4.1 En	502 4.7 Hf	022150	502 8.6 Jo	447 9.9 En
481 8.8 Jo	464 4.2 Ch	502 4.1 Sf	429 11.2 Wp	504 8.7 Jo	450 9.8 Bl
481 8.5 Hf	470 3.9 Pf	502 4.5 Jo	473 12.8 Ch	509 8.5 Jo	460 10.9 Bl
482 8.8 Ah	470 4.1 Ah	503 4.3 Sx	477 12.9 B	512 8.5 Jo	465 11.0 Bl
483 8.8 Ah	471 4.0 Ah	503 4.6 Ra	478 12.5 Ra	W Per	473 12.3 Ht
485 8.7 Jo	471 4.2 Jo	504 4.5 Jo	479 12.7 Ch	024356	475 12.1 Bl
486 9.0 Sx	471 4.2 Ch	504 4.7 Hf	486 13.3 So	471 9.1 Ry	479 12.4 Ht
487 8.8 Jo	472 3.9 Cy	506 4.6 Ra	486 13.4 Wa	472 8.5 Ch	U Ari
490 8.8 Jo	472 3.8 Rb	509 5.0 Jo	486 13.3 Wp	475 9.4 Cy	030514
493 9.0 Ch	472 3.9 Pf	512 4.7 Jo	503 13.3 Wp	475 9.0 Jo	448 14.0 Bm
493 8.9 B	472 4.1 Se	S Per	503 13.4 Wa	477 9.1 B	455 14.2 Bm
496 9.2 Hf	473 3.8 Rb	021558	R For	478 9.4 Ry	472[13.1 Ch
496 9.0 Wd	473 4.1 Se	472 9.3 Sq	*022426*	478 9.4 Ra	X Cet
500 9.7 Pt	474 4.1 Se	475 9.5 Cy	440 11.2 Bl	479 8.5 Ch	*031401*
502 9.4 Jo	474 3.8 Rb	478 9.3 Pk	450 11.2 Bl	481 9.2 Jo	472 11.5 Ch
504 9.5 Jo	474 4.1 Ch	478 10.5 Ra	460 11.0 Bl	481 9.5 Hf	477 11.4 B
504 9.7 Sx	475 4.1 Se	479 9.3 Cy	465 10.8 Bl	481 10.3 Sx	479 11.6 Jo
506 9.6 Jo	475 3.8 Jo	481 10.2 Hf	475 10.8 Bl	482 9.6 Ry	482 10.7 L
509 10.0 Jo	475 4.0 Cy	481 9.4 Pk	477 10.9 Ch	482 9.0 Ch	485 11.2 Gy
512 10.4 Jo	475 3.8 Rb	481 9.8 Sx	484 10.8 Bl	482 9.4 Cy	485 11.2 Jo
W And	475 3.9 Pf	483 9.5 Sq	488 11.0 Bl	482 9.3 Fd	500 10.4 Pt
021143a	476 4.4 Mn	483 9.8 Wd	495 10.6 Bl	486 9.5 Ko	502 10.6 Ah
472 12.4 Ch	477 3.8 Rb	486 10.1 So	U Cet	486 9.7 So	503 11.6 Ra
482 12.4 B	477 4.2 Se	486 10.0 Lr	*022813*	487 9.0 Jo	503 10.3 My
500[11.9 Pt	477 4.1 Ch	486 9.9 Kg	442 9.4 Ch	493 9.5 Ch	504 10.5 Ah
	478 4.1 Cy	487 9.7 Jo	472 11.0 Ch	496 9.5 Ry	509 10.4 Ah

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
X CET	U CAM	R TAU	R RET	R PIC	R LEP
031401	033362	042209	*043263*	*044349*	*045514*
511 10.0 My	504 7.6 Jo	512 8.4 Jo	465 8.0 Bl	440 7.6 Bl	484 9.6 Mn
512 9.9 Ah	506 7.6 Jo	W TAU	473 7.6 Ht	443 7.7 En	485 9.8 Gy
Y PER	509 7.4 Jo	042215	475 7.7 Bl	447 7.5 En	486 9.4 Wd
032043	512 7.6 Jo	475 10.2 Cy	479 7.3 Ht	450 7.8 Bl	486 9.3 So
472 9.8 Sq	U ERI	476 9.9 Jo	484 7.4 Bl	456 7.5 En	486 9.3 Pa
472 9.8 Ch	*034625*	477 9.8 Ch	489 7.5 Bl	460 7.5 Bl	486 7.8 Jo
477 9.7 Jo	473 9.8 Ch	481 9.7 Jo	490 7.5 Ht	465 7.1 Bl	486 9.4 Hf
478 9.3 Pk	482 9.9 L	482 10.2 Cy	495 7.2 Ht	475 7.0 Bl	486 8.6 Kp
478 9.9 Ra	T ERI	482 10.0 B	495 7.7 Bl	475 7.1 Ht	486 9.2 Ko
478 8.8 Wh	*035124*	482 10.2 L	X CAM	479 7.2 Ht	489 8.9 Pa
481 9.5 Jo	473 8.4 Ch	486 10.5 So	043274	484 7.2 Bl	490 7.7 Jo
481 10.0 Hf	482 9.5 L	486 9.9 Jo	442 9.3 Ch	489 7.5 Bl	492 9.4 Mn
481 9.6 Pk	483 8.9 Mi	501 10.5 Pt	449 10.5 Ch	490 7.3 Ht	493 9.3 Ch
482 9.7 Ch	W ERI	502 10.4 Jo	477 13.0 Ch	495 7.4 Ht	493 8.6 Pa
483 9.8 Sq	*040725*	503 10.8 So	479 12.6 Br	495 7.0 Bl	496 8.5 Pa
486 9.5 Ko	473 9.6 Ch	503 9.4 My	501 11.9 Pt	V TAU	496 9.0 Wd
493 9.3 B	481 9.7 Jo	504 10.4 Jo	503 12.5 My	044617	496 7.8 Jo
500 9.0 Pt	482 9.4 L	505 10.5 Fd	505 11.9 B	459 9.0 Ch	496 8.9 Hf
502 9.6 Hf	486 8.8 Jo	506 10.3 Jo	511 11.1 My	472 9.3 Mg	497 8.7 Je
502 8.8 Ah	496 8.6 Jo	509 10.3 Jo	511 11.2 Jo	479 9.2 Ch	501 7.8 Pt
503 9.3 My	503 9.4 Jo	510 9.9 My	R DOR	482 9.3 B	502 9.2 Rc
504 9.4 Sh	506 9.7 Jo	512 10.3 Jo	*043562*	482 9.2 L	502 7.8 Jo
504 8.7 Ah	T TAU	S TAU	426 5.6 Sl	485 9.3 Gy	502 9.3 Hf
509 8.7 Ah	041619	042309	431 5.5 Sl	501 10.0 Pt	505 9.3 Sx
510 9.3 My	448 10.4 Bm	455[14.3 Bm	440 6.1 Bl	502 9.8 Jo	506 7.7 Jo
512 8.5 Ah	455 10.2 Bm	477[14.0 Ch	443 5.2 En	504 9.9 Jo	509 7.6 Jo
R PER	R TAU	480 13.9 Ar	447 5.5 En	506 10.2 Jo	512 7.6 Jo
032335	042209	481 14.1 Ar	449 5.7 Sl	509 10.0 Jo	V ORI
472 8.8 Mg	448 12.4 Bm	482 15.1 L	450 5.8 Bl	512 10.6 Jo	050003
473 8.6 Ch	455 12.0 Bm	483 14.1 Ar	456 5.6 En	R ORI	455 14.2 Bm
475 8.8 Jo	475 10.1 Cy	501[12.0 Pt	459 5.7 Sl	045307	472 14.3 Mg
481 8.7 Jo	475 10.3 Hi	T CAM	460 5.8 Bl	472 10.0 Br	482 14.3 L
481 8.7 Hf	477 9.8 Ch	043065	465 5.8 Bl	472 9.7 Mg	483 14.2 Br
486 8.5 Jo	478 9.6 Br	447 10.2 Ch	473 5.6 Ht	475 10.1 Cy	505 13.1 B
493 8.7 B	479 10.1 Hi	477 11.4 Ch	475 5.9 Bl	477 10.0 Ch	T LEP
499 8.9 Md	480 9.3 Ar	479 11.4 Br	479 5.6 Ht	482 9.5 L	*050022*
500 8.7 Pt	481 9.0 Ar	501 11.5 Pt	484 5.8 Bl	482 10.1 Cy	440 9.6 Bl
502 8.9 Hf	481 8.7 Jo	503 12.7 Ra	489 6.0 Bl	493 9.8 B	443 10.3 En
502 8.8 Jo	481 9.2 Hf	RX TAU	490 5.6 Ht	R LEP	450 9.0 Bl
503 8.8 My	482 8.8 Cy	043208	495 5.6 Ht	*045514*	455 9.8 Bm
504 9.1 Sh	482 8.8 L	472 11.9 Br	495 5.9 Bl	426 8.0 Sl	456 8.9 En
504 8.8 Jo	483 9.0 Ar	477 12.2 Rb	R CAE	431 7.9 Sl	460 9.0 Bl
506 9.3 Ra	485 9.0 Gy	477 12.2 Ch	*043738*	442 9.6 Ch	465 8.8 Bl
508 9.1 Md	485 8.0 Jo	482 11.6 B	440 7.6 Bl	469 9.5 Ch	471 8.6 Jo
509 8.9 Jo	487 8.8 Wd	482 11.6 L	443 8.1 En	471 8.5 Jo	475 8.4 Jo
511 8.9 My	490 8.0 Jo	506 11.0 Jo	447 8.0 En	471 8.2 Sq	475 8.9 Bl
512 8.8 Jo	493 8.3 B	509 10.7 Jo	450 8.5 Bl	475 8.0 Jo	477 8.6 Jo
Nov PER	494 8.8 Hi	512 10.5 Jo	456 9.0 En	476 9.5 Mn	478 8.8 Ch
032443	496 8.6 Jo	R RET	460 8.9 Bl	477 7.9 Jo	479 8.8 Ko
502 13.6 GC	497 8.6 Hf	*043263*	465 9.0 Bl	477 9.4 Pa	481 8.5 Jo
503 13.4 GC	501 9.0 Pt	426 11.2 Sl	475 9.1 Bl	478 8.0 Pk	483 8.8 Mi
508 13.5 GC	502 8.9 Hf	431 10.7 Sl	475 9.2 Ht	480 9.3 Je	484 8.8 Bl
T FOR	502 8.4 Jo	440 9.9 Bl	479 9.7 Ht	481 8.0 Jo	486 8.5 Jo
032528	503 8.6 Ra	443 10.1 En	484 9.5 Bl	481 8.1 Pk	486 8.9 Hf
482 8.6 L	504 8.2 Jo	447 9.8 En	489 9.4 Bl	481 9.5 Sx	486 8.9 Wd
U CAM	504 9.0 Sx	450 8.9 Bl	490 10.0 Ht	481 9.9 Ra	489 9.0 Bl
033362	506 8.3 Jo	456 9.1 En	495 10.1 Ht	482 8.6 Sq	490 8.4 Jo
496 7.5 Jo	509 8.4 Jo	460 8.3 Bl	495 9.9 Bl	484 9.3 Je	495 9.0 Bl

Variable Star Observations Received During March, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
T Lep	T Col	W Aur	T Ori	T Ori	RR Tau
050022	*051533*	052036	*053005a*	*053005a*	053326
496 9.0 Hf	460 8.5 Bl	505 9.1 B	484 9.9 Pt	512 9.5 SR	503 11.8 Wp
496 9.6 Wd	465 8.7 Bl	508 9.3 GC	485 9.6 L	AN Ori	503 12.1 SR
501 9.3 Pt	475 8.3 Bl	511 8.4 Jo	485 9.4 Hu	*053005t*	504 11.2 Me
502 9.2 Wd	475 8.5 Ht	S Ori	485 10.0 Pt	478 11.8 Ar	510 11.6 SR
502 8.6 Jo	479 8.2 Ht	*052404*	485 9.3 Ar	481 11.8 Ar	511 11.4 Gy
504 9.3 Mi	484 7.8 Bl	442 10.1 Ch	485 9.8 Jo	483 11.6 Ar	512 11.5 SR
505 9.0 B	489 7.6 Bl	459 9.8 Ch	486 9.7 Jo	483 11.6 Wd	RU Aur
506 8.9 Jo	490 7.8 Ht	472 9.8 Ch	486 9.5 Ko	483 11.8 Hu	053337
507 9.2 Wd	495 7.9 Ht	472 10.0 Br	486 9.8 Hf	486 11.8 Wd	478[13.4 Ch
509 8.9 Jo	495 7.8 Bl	472 10.0 Mg	486 9.7 Wd	486 11.7 Hf	483[14.2 L
512 9.0 Jo	S Aur	475 9.6 Jo	486 9.5 So	488 11.3 Ar	501[12.0 Pt
S Pic	052034	477 10.2 Jo	486 9.9 B	495 11.3 Ar	508[13.4 GC
050848	442 10.5 Ch	477 10.5 Rb	486 9.7 Pt	496 11.4 Ar	U Aur
450[13.4 Bl	459 9.8 Ch	477 9.8 Ch	487 9.8 Pt	496 11.6 Hf	053531
456[12.9 En	475 9.2 Jo	481 10.3 Jo	487 10.2 Jo	496 11.7 Wd	478 13.8 Ch
476[13.4 Bl	478 8.7 Pk	481 10.2 Sx	488 9.8 Ar	502 11.8 Wd	479 13.9 Br
490[13.4 Ht	478 10.2 Ch	481 10.2 Ra	488 10.0 Ch	509 11.7 Wd	483 14.4 L
R Aur	481 8.7 Pk	482 9.9 L	490 9.7 Jo	S Cam	503 13.4 B
050953	481 8.8 Jo	482 10.6 Mg	493 9.8 B	053068	SU Tau
477 11.2 Jo	483 10.3 Hu	482 10.0 B	495 9.5 Ar	447 10.2 Ch	054319
477 10.8 Ch	483 8.9 L	483 10.6 Rb	496 9.7 Hf	476 8.9 Jo	430 10.1 Wp
477 9.7 Wh	485 10.2 Gy	485 10.3 Gy	496 9.6 Ar	477 9.8 Ch	441 9.8 Ch
478 10.5 Ar	485 9.6 Hu	486 10.3 So	496 9.7 Wd	481 8.7 Jo	442 10.1 Ch
480 10.5 Ar	485 8.7 Jo	501 10.8 Pt	497 9.7 Hf	501 9.9 Pt	447 10.8 Wp
481 10.5 Ar	486 9.8 Hf	502 10.2 Jo	499 9.8 Pt	502 8.5 Pt	459 10.8 Ch
481 10.7 Jo	486 10.5 So	503 10.5 So	500 9.7 Pt	502 9.8 Hf	461 10.4 Cy
483 10.5 Ar	486 9.8 Wd	504 10.4 Jo	501 9.5 Pt	503 8.9 My	464 10.4 Cy
489 10.8 Ch	486 10.4 Ko	509 10.6 Jo	501 9.7 Me	504 8.7 Jo	472 10.3 Cy
495 10.5 Ar	489 10.4 Ch	T Ori	502 9.7 Hf	511 9.0 Jo	472 10.4 Br
500 9.9 Ra	496 9.7 Wd	*053005a*	502 9.5 B	511 8.7 My	474 10.4 Br
501 10.7 Pt	496 9.6 Hf	442 11.0 Ch	502 9.6 Wd	RR Tau	475 10.2 Cy
502 10.4 Jo	501 9.2 Pt	459 10.5 Ch	502 9.5 Pt	053326	475 11.0 Ch
504 10.3 Jo	501 9.9 Ra	459 9.8 Cy	502 9.7 Jo	429 12.1 Wp	477 10.3 Cy
507 10.5 Wd	502 9.0 Jo	461 9.5 Cy	502 9.6 Sh	430 12.3 Wp	477 10.8 Ch
511 10.0 Jo	502 9.8 Hf	464 9.8 Cy	503 9.4 GC	447 12.0 Wp	478 10.2 Cy
T Pic	503 9.4 My	471 9.7 Jo	503 9.5 So	455 13.0 Bm	478 10.6 Br
051247	503 9.7 So	472 9.8 Cy	503 9.5 My	472 11.5 Br	479 10.6 Br
440 8.7 Bl	503 9.4 B	472 10.0 Ch	503 9.3 SR	472 11.5 Cy	479 10.8 Ko
443 8.8 En	504 9.7 Sh	475 9.6 Jo	504 9.4 Me	474 12.2 Br	480 10.7 Br
447 8.9 En	504 9.1 Jo	476 10.2 Jo	504 9.6 Hf	475 12.2 Cy	481 10.7 Br
450 9.3 Bl	511 9.0 Jo	477 10.5 Jo	504 9.7 Sh	477 12.7 Cy	481 10.6 Ar
456 9.0 En	511 9.2 My	478 9.9 Ar	504 9.5 Pt	478 12.4 Br	482 10.7 Br
460 9.6 Bl	511 9.6 Gy	479 10.5 Jo	504 9.7 Jo	479 12.4 Br	482 9.9 L
465 9.8 Bl	W Aur	479 9.9 Ko	505 9.4 SR	479 12.5 Cy	483 10.7 Br
475 10.7 Bl	052036	480 9.5 Ar	505 9.5 Pt	480 12.5 Br	483 10.6 Ar
475 10.3 Ht	475 12.8 Hi	481 10.4 Jo	505 9.6 Sx	481 12.4 Br	483 10.3 Mi
479 10.9 Ht	478 13.0 Ch	481 10.0 Hf	506 9.6 Jo	482 12.3 Br	483 10.7 Pt
484 11.1 Bl	479 12.0 Br	481 10.0 Ar	507 9.5 Pt	482 12.5 L	484 10.5 Pt
489 11.3 Bl	483 12.0 L	481 9.8 Ra	508 9.4 GC	483 12.7 L	484 10.6 Mi
490 11.6 Ht	486 12.1 Wd	481 9.6 Sx	508 9.6 Hf	483 12.6 Br	485 10.8 Pt
495 11.3 Bl	486 11.9 Hf	482 10.1 B	509 9.5 Wd	485 13.0 L	485 9.8 L
T Col	494 10.6 Hi	482 10.0 L	509 9.7 Jo	486 13.3 Br	485 10.7 Hu
051533	496 10.0 Wd	483 9.9 L	510 9.4 SR	486 13.4 Wa	485 10.4 Gy
438 9.5 En	496 10.3 Hf	483 9.9 Pt	510 9.7 My	486 13.4 Wp	485 10.8 Ar
440 9.6 Bl	501 9.8 Pt	483 9.9 Hu	510 9.5 Pt	490 13.2 Br	486 10.7 Hf
447 9.0 En	502 9.6 Jo	483 9.8 Wd	511 9.8 My	501 12.8 Me	486 10.7 Br
450 8.8 Bl	503 9.5 GC	483 9.7 Bc	511 9.8 Jo	503 11.8 B	486 10.4 Ko
456 8.7 En	504 9.0 Jo	483 9.4 Ar	512 9.9 Jo	503 11.8 Wa	486 10.8 Mi

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.
SU TAU	Z TAU	U ORI	R OCT	R MON	X MON
054319	054615a	054920a	*055686*	063308	*065208*
486 10.7 Wa	455 13.1 Bm	486 7.8 Pa	475 10.6 Ht	480 13.2 Ch	473 7.3 Se
486 10.9 Wd	472 13.3 Br	486 8.0 Kg	479 10.5 Ht	481 12.5 Ar	475 7.2 Se
486 10.8 Pt	475 13.8 Ch	487 8.8 Kp	484 11.0 Bl	483 12.3 Ar	476 7.7 Jo
486 10.7 Wp	483 13.1 Br	488 7.2 Ch	489 11.1 Bl	488 12.4 Ar	477 7.2 Se
487 10.8 Pt	483 13.6 L	489 8.3 Pa	490 10.9 Ht	495 11.6 Ar	479 7.1 Se
488 10.1 Ch	RU TAU	489 8.3 Wd	495 11.2 Bl	509 11.3 Jo	481 7.1 Hf
488 10.9 Ar	054615c	493 8.2 Pa	X AUR	512 11.3 Jo	481 7.5 Jo
489 10.3 Wd	455∫14.7 Bm	496 8.5 Wd	060450	NOV PIC	481 7.3 Sx
490 10.6 Br	472∫14.1 Br	496 8.5 Hf	441 11.5 Ch	*063462*	482 7.0 Se
495 10.6 Ar	483 14.4 Br	497 8.1 Je	447 11.8 Ch	443 8.7 En	485 7.2 Gy
496 10.4 Wd	R COL	500 8.6 Mc	475 13.0 Ch	447 8.7 En	486 7.3 Jo
496 10.3 Hf	*054620*	501 8.5 Pt	477 12.8 Ch	456 8.8 En	486 7.0 Se
499 10.5 Pt	443∫13.0 En	502 8.6 Kg	481 12.2 Br	473 8.8 Ht	489 7.1 Wd
500 10.4 Pt	450 13.5 Bl	502 8.7 So	488 11.6 Ch	479 8.8 Ht	489 7.4 Pa
501 10.2 Me	475 14.0 Ch	502 8.6 Wd	500 11.3 Ra	490 8.8 Ht	493 7.4 Pa
501 10.5 Pt	490∫13.0 Ht	502 8.5 Ah	501 10.8 Pt	495 8.7 Ht	497 7.2 Hf
502 10.4 Pt	α ORI	502 8.4 Jo	511 9.5 Jo	S LYN	502 7.4 Jo
502 10.1 Hf	054907	502 8.5 Hf	V AUR	063558	504 8.0 Sh
502 10.4 Sh	426 0.3 Sl	503 8.5 Rc	061647	476 10.0 Ch	504 7.3 Sx
502 10.6 Wd	431 0.3 Sl	504 8.5 Jo	475 11.5 Ch	479 10.3 Br	504 7.7 Hf
503 10.6 Wp	U ORI	505 8.8 Sx	483 10.5 L	480 10.1 Ch	506 7.6 Jo
503 10.6 Wa	054920a	509 8.7 Wd	485 10.8 Gy	483 10.5 Ry	511 7.6 Jo
503 9.8 B	441 6.7 Ch	511 8.9 Gy	503 10.6 So	488 10.5 Ch	R LYN
503 10.2 Pt	447 6.6 Ch	511 8.6 Jo	511 10.7 Gy	496 10.8 Ry	065355
503 9.8 SR	459 7.0 Ch	UW ORI	511 9.5 Jo	500 11.4 Ra	476 10.0 Ch
504 10.2 Pt	471 7.4 Ah	054920b	V MON	503 11.3 My	479 10.8 Br
504 10.2 Me	471 7.8 Jo	489 10.6 Wd	*061702*	503 12.1 GC	480 10.5 Ch
504 10.2 Hf	472 7.8 Kp	502 10.8 Wd	472 11.3 Br	508 11.9 GC	500 11.5 Ra
504 10.3 Mi	473 7.8 Kp	502 10.5 Sh	476 10.9 Ch	511 11.5 My	504 10.0 Sx
505 10.2 Mi	473 7.5 Pa	509 10.8 Wd	481 10.9 Jo	512 11.9 Sf	505 10.0 Sx
505 10.1 Pt	474 7.0 Sq	V CAM	486 10.4 Jo	X GEM	513 11.7 Ma
506 10.2 Pt	474 8.0 Kp	054974	486 10.5 Pa	064030	RS GEM
507 10.1 Pt	475 8.0 Kp	479∫13.9 Br	487 10.7 Wd	470 10.1 Bn	065530
508 10.2 Pt	475 7.2 Ch	501∫12.6 Pt	490 10.6 Br	475 10.3 Cy	471 11.5 Jo
509 10.1 Pt	476 7.8 Kp	Z AUR	501 8.8 Pt	476 10.2 Bn	479 11.8 Jo
509 10.1 Wd	476 7.8 Jo	055353	502 9.6 Jo	478 10.7 Bn	484 11.9 L
510 9.9 Pt	477 8.0 Kp	472 10.4 Cy	502 9.8 Hf	479 10.8 Br	503 11.5 SR
510 10.1 SR	478 8.3 Kp	475 10.2 Cy	504 9.7 Sh	482 11.5 Cy	506 10.5 Jo
511 10.0 Gy	479 8.3 Kp	479 10.4 Cy	506 9.5 Ra	484 10.9 L	508 10.8 So
512 10.0 SR	480 8.3 Kp	481 9.7 Jo	506 9.3 Jo	485 11.5 Bn	510 11.4 SR
512 10.1 Sf	481 8.0 Jo	482 10.2 Cy	511 8.9 Jo	489 11.1 Bn	511 10.6 Jo
S COL	481 7.6 Hf	483 10.4 Pt	AG AUR	490 11.2 Bn	512 11.5 SR
054331	481 8.3 Kp	483 10.0 Hi	062047	500 11.6 Ra	513 10.9 Ma
443 12.6 En	481 7.9 Ra	485 10.3 Hi	483 10.0 L	509 12.5 Wd	Z UMA
447 12.9 En	481 7.6 Sx	500 10.5 Pt	UU AUR	Y MON	*065911*
450 12.3 Bl	482 8.4 Kp	503 10.6 Pt	062938	065111	426 10.0 Sl
456 12.4 En	482 7.6 Ah	504 10.6 Pt	405 5.5 Lt	472 10.6 Br	431 10.0 Sl
460 12.2 Bl	483 7.8 Ah	504 10.3 Jo	417 5.4 Lt	476 10.6 Ch	450 10.4 Bm
465 12.0 Bl	483 8.4 Kp	510 10.3 Pt	427 5.7 Lt	481 10.9 Jo	455 10.6 Bm
475 11.8 Bl	484 8.5 Kp	511 9.5 Jo	442 5.7 Lt	484 9.6 L	V CMI
475 12.3 Ht	484 7.4 Sq	R OCT	446 5.6 Lt	489 10.9 Pa	070109
479 11.9 Ht	484 8.0 Je	*055686*	U LYN	502 9.5 Hf	442 11.4 Ch
484 11.4 Bl	485 8.2 Gy	440 8.4 Bl	063159	504 9.4 Sh	476 13.4 Ch
489 11.3 Bl	485 7.5 L	447 9.1 En	479 14.3 Br	506 9.6 Ra	479 13.5 Br
490 10.9 Ht	486 7.6 Wd	450 9.4 Bl	508∫13.4 GC	511 9.3 Jo	484 13.7 L
495 10.6 Ht	486 8.0 Lr	460 9.9 Bl	R MON	X MON	490 13.7 Br
495 10.3 Bl	486 7.6 Hf	465 10.0 Bl	063308	*065208*	500∫12.0 Ra
	486 8.5 Kp	475 10.5 Bl	476 13.2 Ch	471 7.8 Jo	511∫12.7 Gy

Variable Star Observations Received During March, 1934.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R Gem			TW Gem			V Gem			U CMi			T Gem			V Cnc		
070122a			070122c			071713			073508			074323			081617		
441	6.6	Ch	503	8.5	Pt	503	9.7	GC	479	9.5	Br	488	8.4	Ch	503	9.5	Ra
447	6.7	Ch	505	8.6	Sx	508	9.0	GC	482	9.2	Cy	503	8.8	Pt	503	9.7	Sx
471	7.5	Ah	509	8.4	Wd	511	8.9	Jo	484	9.5	L	511	8.7	Jo	511	9.8	Gy
472	6.7	Br	R CMi			S CMi			485	9.3	Jo	513	9.5	Ma	RT Hya		
472	7.0	Rb	070310			072708			486	9.2	B	U Pup			*082405*		
472	7.2	Se	442	9.5	Ch	476	11.2	Ch	490	9.0	Jo	*075612*			471	7.5	Jo
473	7.3	Se	471	8.8	Ah	479	11.4	Br	511	8.5	Jo	475	13.4	Ch	475	7.4	Jo
475	7.4	Jo	472	8.4	Sq	479	11.7	Jo	S Gem			503	13.6	GC	479	7.3	Ko
475	7.4	Se	475	8.4	Jo	482	11.1	Ch	*073723*			RV Cnc			485	7.4	Jo
476	7.0	Ch	476	8.2	Ch	482	9.7	Wh	442	11.6	Ch	080319			490	7.5	Jo
477	7.5	Se	479	8.2	Jo	484	10.4	L	449	10.1	Ch	483	12.2	Br	502	7.4	Jo
479	7.6	Se	481	8.1	Hf	485	11.0	Jo	471	9.3	Jo	486	12.2	Br	503	8.3	GC
479	7.5	Jo	482	8.4	Ah	486	10.2	B	472	9.8	Br	490	12.3	Br	503	7.2	My
480	7.5	B	483	8.2	Ah	488	10.0	Ch	475	9.1	Jo	R Cnc			504	7.4	Jo
481	7.5	Hf	484	8.2	L	490	10.2	Br	475	9.7	Cy	081112			506	7.6	Jo
481	7.4	Sx	484	8.3	Sq	500	9.5	Ra	476	9.3	Ch	448	10.7	Ch	511	7.1	My
482	7.3	Ch	485	7.7	Jo	502	9.7	Jo	477	9.0	Ch	472	10.3	Sq	R Cha		
482	7.5	Rb	485	8.5	Gy	502	9.9	Hf	479	9.4	Jo	475	10.0	Jo	*082476*		
482	7.6	Ah	486	8.7	So	503	9.7	Wa	480	9.5	Ch	477	9.8	Jo	426	12.6	Sl
483	7.6	Ah	486	8.2	Wa	503	9.8	Wp	481	9.5	Hf	477	10.0	Cy	431	12.9	Sl
483	7.5	Wd	486	8.4	Wp	503	10.0	Pt	482	9.8	Cy	479	9.7	Jo	443[	12.4	En
484	7.7	B	490	7.8	Jo	505	9.6	Fd	483	9.6	Jo	480	10.2	Ch	450[	12.6	Bl
484	7.5	L	497	8.4	Hf	506	9.8	Wd	484	9.7	L	482	10.2	Sq	476[	12.6	Bl
485	7.6	Ra	500	7.8	Ra	506	9.8	Hf	484	9.7	B	482	10.2	Ah	490[	12.6	Ht
486	7.0	Wa	502	7.9	Ah	511	9.0	Jo	488	9.7	Ch	483	10.1	Ar	U Cnc		
486	7.0	Wp	502	8.0	Jo	T CMi			502	9.9	Hf	484	10.3	Mi	083019		
488	7.4	Ch	503	8.3	Sx	072811			503	10.0	Wa	484	10.2	Je	476	13.4	Ch
496	7.5	Hf	504	8.3	Sh	476	11.4	Ch	503	9.9	Wp	485	10.3	L	477	13.5	B
496	7.6	Wd	504	8.3	Hf	479	10.8	Br	503	10.2	Pt	485	9.5	Jo	479	12.8	Br
497	7.6	B	506	8.4	Hf	479	10.3	Jo	W Pup			486	10.1	Hf	482	12.5	Cy
502	8.0	Kg	506	8.4	Wd	484	11.1	B	*074241*			486	10.0	Wd	484	12.2	B
502	7.9	Sh	510	8.2	Gs	484	10.4	L	440	12.2	Bl	498	10.5	Jo	485	12.3	L
502	7.8	Hf	511	8.2	Gy	486	11.2	Wp	443	11.9	En	502	9.9	Hf	490	12.0	Br
502	7.8	Wd	511	7.8	Jo	486	11.0	Wa	450	10.9	Bl	503	9.8	Pt	503	10.4	GC
502	7.8	Ah	R Vol			503	11.5	Wa	457	10.1	En	503	9.4	Ra	508	10.4	GC
502	7.8	Jo	*070772*			503	11.6	Wp	460	9.9	Bl	503	9.4	Jo	510	10.4	Ma
503	7.8	Pt	443[	13.4	En	503	11.6	Pt	465	9.5	Bl	504	9.8	Sx	X UMa		
505	8.2	Sx	490[	13.4	Ht	511	11.5	Jo	475	9.0	Bl	511	8.6	Jo	083350		
509	7.8	Wd	L2 Pup			Z Pup			475	8.8	Ht	V Cnc			471	10.5	Jo
511	7.8	Jo	*071044*			*072820b*			479	8.7	Ht	081617			475	10.2	Jo
Z Gem			426	5.1	Sl	443	12.6	En	484	8.2	Bl	471	8.8	Ah	477	10.1	Jo
070122b			431	5.0	Sl	450	13.6	Bm	489	8.2	Bl	475	8.2	Jo	477	10.9	B
483	12.5	Wd	449	4.4	Sl	455	13.3	Bm	490	8.7	Ht	476	8.0	Ch	479	11.0	Br
485	11.2	Ra	459	4.3	Sl	475	13.5	Ch	495	8.7	Ht	477	8.7	Cy	479	9.9	Jo
502	12.5	Wd	RR Mon			508[	13.0	GC	495	8.0	Bl	479	8.5	Br	483	10.0	Jo
503	12.5	Pt	071201			S Vol			T Gem			479	8.4	Jo	490	10.0	Jo
509	12.4	Wd	476[	13.4	Ch	*073173*			074323			480	8.2	Ch	490	10.6	Br
TW Gem			490[	13.4	Br	443[	13.2	En	442	8.4	Ch	482	8.9	Ah	503	10.9	B
070122c			508[	13.2	GC	450[	13.2	Bl	471	8.2	Jo	483	9.0	Ah	503	9.6	Jo
481	8.5	Hf	V Gem			476[	13.2	Bl	472	8.0	Ch	485	8.9	Gy	504	10.9	Hf
481	8.6	Sx	071713			490[	13.2	Ht	475	8.3	Jo	485	8.8	Pk	506	9.5	Jo
483	8.5	Wd	475	10.2	Jo	U CMi			475	8.5	Cy	485	8.7	Jo	S Hya		
485	8.4	Ra	476	11.3	Ch	073508			479	8.5	Jo	485	8.8	L	084803		
496	8.4	Wd	479	10.8	Br	475	9.4	Jo	479	8.5	Br	486	8.9	Hf	475	13.2	Ch
496	8.5	Hf	484	10.9	B	475	9.3	Cy	480	8.1	Ch	486	9.0	B	477	13.0	B
502	8.3	Hf	484	11.2	L	476	9.3	Ch	482	8.5	Cy	486	8.9	Wd	479	12.6	Br
502	8.4	Sh	502	9.4	Jo	477	9.4	B	483	8.6	Jo	502	9.4	Hf	480	13.0	Ch
502	8.3	Wd	503	9.3	Pt	479	9.1	Cy	484	8.7	L	502	9.6	Ah	485	11.6	Jo

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
S HYA	V UMA	X HYA	R LEO	V LEO	W VEL
084803	090151	*093014*	094211	095421	*101153*
486 12.0 Hf	503 10.3 B	478 12.4 Ch	485 8.4 Ch	490 13.3 Br	457[13.0 En
486 11.9 B	503 9.8 Jo	503 11.0 GC	486 9.0 Kp	503 13.8 GC	490[13.0 Ht
486 12.1 Wd	506 9.7 Jo	503 10.7 B	486 8.5 Kg	510 13.7 Ma	U HYA
490 11.7 Br	511 10.3 Jo	503 10.7 Pt	486 8.6 Mi	RR CAR	*103213*
503 11.1 GC	W CNC	511 10.8 Gy	486 8.5 Lr	*095458*	478 5.5 Ch
503 10.9 Pt	090425	Y DRA	486 8.1 Ba	445 7.9 En	RZ CAR
508 11.1 GC	476 12.4 Ch	093178	487 9.1 Kp	457 8.0 En	*103270*
511 10.2 Jo	480 12.7 Br	480 13.8 Br	489 8.5 Wd	473 7.9 Ht	455[13.1 En
T HYA	482 12.8 Cy	511 12.2 Jo	490 8.0 Jo	479 7.8 Ht	490[13.6 Ht
085008	484 12.2 B	R LMI	493 8.6 Ch	490 7.6 Ht	R UMA
475 8.0 Jo	485 12.8 L	093934	497 8.0 Je	495 7.5 Ht	103769
475 7.8 Ch	RW CAR	476 13.4 Ch	500 8.4 Mc	RV CAR	448 7.4 Ch
477 7.8 Cy	*091868*	480 13.3 Ch	500 8.4 Ra	*095563*	471 7.8 Ah
480 7.9 Ch	440 9.9 Bl	480 12.4 Br	502 8.7 Ah	457[13.1 En	471 7.3 Jo
482 8.4 Cy	443 9.9 En	484 13.1 B	502 8.9 Kg	476[13.1 Bl	472 7.5 Cy
485 7.7 Jo	450 10.4 Bl	490 13.0 Br	502 9.0 Hf	490[13.1 Ht	473 7.7 Sq
486 8.1 B	457 10.7 En	503 12.2 Pt	503 9.0 Sx	S CAR	476 7.5 Mn
497 8.1 Hf	460 10.7 Bl	510 11.0 Gs	503 8.4 Jo	*100661*	477 7.4 Jo
503 8.2 GC	465 10.9 Bl	RR HYA	503 9.4 SR	426 5.9 Sl	478 7.9 Ch
504 7.6 Sx	473 11.6 Ht	094023	503 8.5 Pt	431 5.9 Sl	480 8.0 Je
506 7.5 Wd	475 12.0 Bl	446 13.0 En	504 9.0 Sh	440 5.4 Bl	480 8.2 Br
506 7.6 Jo	479 11.8 Ht	450 12.6 Bm	504 9.1 Mi	443 5.8 En	481 7.5 Jo
506 7.7 Hf	490 12.6 Ht	457 12.1 Bm	505 9.2 Mi	445 6.0 En	481 7.9 Hf
511 7.5 Jo	Y VEL	465 11.7 Bm	505 9.3 SR	449 5.7 Sl	481 7.8 Ah
T CNC	*092551*	478 11.1 Ch	506 8.2 Jo	450 6.5 Bl	481 7.5 Ra
085120	450 13.3 Bl	503 9.6 GC	507 8.5 Mc	455 6.0 En	482 7.8 Cy
475 8.5 Jo	465 13.4 Bl	504 10.3 Mi	508 8.8 So	457 6.1 En	483 7.5 Wd
476 9.2 Ch	475 13.5 Bl	R LEO	509 8.3 Jo	459 5.8 Sl	483 7.8 Ah
477 9.6 Cy	484 13.4 Bl	094211	510 8.6 Ma	460 6.2 Bl	484 8.0 Sq
481 8.5 Jo	489 13.5 Bl	448 7.4 Ch	510 9.3 SR	465 5.8 Bl	484 7.0 Mn
485 8.4 Jo	495 13.4 Bl	471 7.2 Sq	512 9.3 SR	473 6.0 Ht	485 8.3 Gy
485 8.9 L	R CAR	471 7.6 Ah	512 8.7 Jo	475 6.3 Bl	486 8.0 Je
490 8.3 Jo	*092962*	472 7.7 Kp	Y HYA	479 6.0 Ht	487 7.7 Jo
503 8.6 Pt	426 6.4 Sl	473 7.8 Kp	*094622*	484 6.6 Bl	489 7.8 Wd
506 8.3 Jo	431 6.2 Sl	473 7.3 Se	446 7.5 En	489 6.7 Bl	490 7.9 Jo
511 8.4 Jo	440 6.3 Bl	475 7.7 Jo	Z VEL	490 6.2 Ht	492 8.0 Mn
S PYX	443 6.0 En	475 8.0 Kp	*094953*	495 6.6 Ht	493 7.9 Ch
090024	446 6.0 En	476 7.9 Kp	426 12.6 Sl	495 6.5 Bl	496 8.2 Hi
457 12.3 Bm	449 5.6 Sl	477 8.2 Kp	431 12.1 Sl	U UMA	496 7.8 Jo
465 11.7 Bm	450 6.0 Bl	477 7.7 Jo	440 12.3 Bl	100860	497 8.1 Je
478 10.9 Ch	455 5.5 En	478 8.4 Kp	443 11.8 En	473 6.4 Se	497 8.2 Hf
486 10.5 Ko	457 5.2 En	478 7.6 Ch	450 11.8 Bl	477 6.3 Se	500 8.2 Mc
503 10.6 GC	459 5.4 Sl	479 8.4 Kp	457 11.9 En	478 6.5 Ch	502 8.1 Sh
T PYX	460 5.5 Bl	480 8.6 Kp	460 11.9 Bl	484 6.7 Mn	502 8.1 Wd
090031	465 5.5 Bl	480 7.8 Je	465 11.6 Bl	Z CAR	502 8.2 Ah
450 [t Bl	473 4.9 Ht	481 7.9 Hf	473 11.9 Ht	*101058a*	502 7.8 Jo
476 [t Bl	475 4.6 Bl	481 7.3 Pk	475 11.4 Bl	475 12.0 Bl	503 8.5 Pt
V UMA	479 4.6 Ht	482 7.5 Se	479 11.9 Ht	475 11.6 Ht	505 8.5 Sx
090151	484 4.6 Bl	482 8.2 Rb	484 11.6 Bl	476 11.7 Bl	506 8.0 Jo
471 10.3 Jo	489 4.6 Bl	482 8.6 Kp	489 11.6 Bl	479 11.7 Ht	507 8.5 Mc
475 10.4 Jo	490 4.6 Ht	482 7.6 Sq	490 12.1 Ht	484 11.6 Bl	509 8.0 Jo
477 10.0 Jo	495 4.6 Ht	482 8.0 Ch	495 11.5 Bl	489 11.5 Bl	509 8.5 Wd
477 10.4 B	495 4.0 Bl	482 8.2 Ah	V LEO	490 11.5 Ht	512 7.9 Jo
479 10.2 Jo	X HYA	483 8.3 Ah	095421	495 11.6 Ht	V HYA
483 10.3 Jo	*093014*	483 8.4 Wd	448 11.8 Ch	495 11.5 Bl	*104620*
486 10.3 Jo	450 12.9 Bm	483 8.7 Kp	478 13.4 Ch	W VEL	450 7.9 Bl
490 10.2 Jo	457 12.8 Bm	484 8.8 Kp	480 13.1 Br	*101153*	460 8.0 Bl
500 10.4 Mc	465 12.6 Bm	484 8.6 Mi	484 13.2 B	450[13.0 Bl	465 7.7 Bl

Variable Star Observations Received During March, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
V Hya	RY Car	R Com	T CVn	T UMa	S UMa
104620	*111561*	115919	122532	123160	123961
471 8.2 Jo	479 13.1 Ht	481 10.6 Jo	506 10.4 Jo	507 10.5 Mc	502 8.4 Wd
475 7.8 Bl	489 13.5 Bl	482 9.6 Fd	509 10.5 Jo	509 11.3 Jo	502 8.4 Ah
477 8.2 Jo	RS Cen	486 10.0 Jo	512 10.6 Jo	509 11.4 Wd	502 7.9 Jo
478 7.0 Ch	*111661*	502 8.7 Hf	Y Vir	510 12.1 Ma	503 8.6 Pt
481 8.2 Jo	445 13.1 En	502 8.6 Jo	*122803*	512 11.7 Jo	504 8.7 Mi
484 7.7 Bl	450 12.9 Bl	503 8.7 Wa	450 9.2 Bm	R Vir	505 8.7 Fd
485 8.2 Ch	455 12.1 En	503 8.9 Wp	457 9.5 Bm	123307	505 8.6 Rc
486 7.3 Ko	457 12.1 En	504 8.5 Jo	465 9.6 Bm	481 10.2 Jo	506 7.9 Jo
487 7.8 Jo	460 12.2 Bl	506 8.5 Jo	485 10.2 Ch	482 10.7 Fd	507 9.0 Mc
489 7.8 Bl	465 10.7 Bl	509 8.5 Jo	485 10.2 L	485 10.5 Ch	508 8.7 Hf
495 7.5 Bl	475 9.6 Bl	512 8.4 Jo	509 11.4 Jo	485 10.9 L	509 8.5 Wd
496 7.5 Jo	475 9.5 Ht	SU Vir	510 11.3 Ma	502 11.5 Jo	509 8.0 Jo
502 7.7 Jo	479 9.3 Ht	120012	511 11.0 My	502 10.6 Rc	510 8.4 Ma
504 7.7 Jo	484 9.2 Bl	425 12.2 L	U Cen	503 11.3 Pt	512 8.1 Jo
506 7.6 Jo	489 9.2 Bl	477 12.3 Cy	*122854*	504 11.7 Mi	RU Vir
509 7.6 Jo	490 9.1 Ht	478 12.4 Ch	440 9.3 Bl	506 11.0 Pa	124204
511 7.5 Jo	495 9.2 Ht	504 11.5 Jo	446 10.0 En	509 11.8 Jo	485 13.5 L
RS Hya	495 9.2 Bl	509 10.5 Jo	450 10.5 Bl	510 11.6 Ma	503 12.4 Pt
104628	X Cen	510 9.9 Ma	465 11.3 Bl	RS UMa	U Vir
450 11.0 Bl	*114441*	511 9.9 My	475 11.8 Bl	123459	*124606*
460 11.3 Bl	450 9.7 Bl	512 9.8 Jo	475 12.1 Ht	450 13.7 Bm	482 12.1 Fd
465 11.5 Bl	460 8.5 Bl	T Vir	479 12.5 Ht	457 13.7 Bm	485 11.8 L
475 11.8 Bl	465 8.5 Bl	*120905*	484 12.0 Bl	465 13.7 Bm	RV Vir
478 11.6 Ch	475 8.3 Bl	485 13.2 L	490 12.3 Ht	480 14.0 Br	*130212*
484 12.0 Bl	475 8.0 Ht	R Crv	T UMa	483 14.8 Fd	485 14.2 L
489 12.0 Bl	479 8.2 Ht	*121418*	123160	509 13.5 Wd	U Oct
503 12.8 GC	484 8.6 Bl	431 13.7 Sl	448 8.8 Ch	510 13.7 Ma	*131283*
W Leo	489 8.5 Bl	450 13.5 Bm	471 9.0 Jo	S UMa	447 12.6 En
104814	490 8.4 Ht	457 13.0 Bm	471 9.4 Ah	123961	450 12.6 Bl
450 12.4 Bm	495 8.4 Ht	465 13.6 Bm	473 9.7 Sq	448 8.3 Ch	476 13.4 Bl
457 12.5 Bm	495 8.5 Bl	477 11.5 Cy	475 9.5 Jo	471 7.6 Jo	479 13.2 Ht
465 12.3 Bm	AD Cen	502 10.9 Sh	476 10.1 Mn	471 8.2 Ah	V Vir
478 12.6 Ch	*114858*	502 11.0 Wd	477 9.7 Jo	473 7.5 Sq	*132202*
482 12.5 Fd	475 9.4 Ht	503 11.1 Pt	478 9.7 Ch	475 7.6 Jo	477 8.5 Cy
484 12.9 B	479 9.5 Ht	504 10.5 Mi	480 10.0 Br	476 7.9 Mn	485 7.8 L
490 13.2 Br	490 9.6 Ht	509 10.5 Jo	481 9.8 Jo	477 7.5 Jo	492 9.1 Ar
503 12.5 GC	495 9.6 Ht	512 10.2 Jo	481 10.0 Ra	478 8.0 Ch	502 8.5 Hf
508 12.9 So	W Cen	SS Vir	481 10.1 Ah	480 8.4 Je	504 8.7 Mi
510 13.6 Ma	*115058*	122001	482 10.2 Fd	481 7.4 Jo	510 8.8 Ma
RS Car	440 8.6 Bl	481 8.7 Jo	483 10.1 Wd	481 7.6 Ra	511 8.9 Jo
110361	446 8.6 En	485 8.6 L	483 10.3 Ah	481 8.1 Ah	R Hya
457 12.3 En	450 8.2 Bl	504 8.4 Jo	484 10.3 Mn	482 8.6 Fd	*132422*
S Leo	455 8.1 En	509 8.3 Jo	484 9.7 Sq	483 8.0 Wd	450 9.2 Bl
110506	457 8.6 En	512 8.3 Jo	485 9.9 Gy	483 8.1 Ah	465 7.8 Bl
477 11.8 Cy	460 8.1 Bl	T CVn	485 10.0 Ch	484 7.7 Mn	475 7.3 Bl
478 11.6 Ch	465 8.0 Bl	122532	486 10.2 Wd	484 8.1 Sq	479 7.8 Ht
510 12.9 Ma	475 8.4 Bl	462 9.6 Cy	486 10.2 Jo	485 8.2 Ch	484 7.4 Bl
RY Car	475 8.5 Ht	477 9.7 Cy	486 10.0 Hf	485 8.7 Gy	485 8.0 L
111561	479 9.1 Ht	478 9.8 Ch	486 10.3 Br	486 8.4 Je	487 7.8 Ch
440 12.0 Bl	484 8.8 Bl	481 9.7 Jo	490 10.4 Jo	486 8.1 Wd	489 7.4 Bl
443 12.1 En	489 9.2 Bl	482 9.9 Fd	502 11.2 Wd	486 7.7 Jo	490 7.6 Ht
445 12.1 En	490 9.5 Ht	485 9.9 Ch	502 11.0 Ah	486 8.4 Hf	495 7.3 Ht
450 12.5 Bl	495 9.8 Ht	486 9.9 Jo	502 11.1 Sh	490 7.8 Jo	495 7.4 Bl
455 12.4 En	495 9.4 Bl	490 10.1 Jo	502 11.0 Jo	492 7.8 Mn	503 7.1 Pt
457 12.4 En	R Com	502 10.3 Rc	503 12.0 Pt	497 8.4 Je	S Vir
460 12.5 Bl	115919	502 10.0 Jo	504 11.5 Mi	497 8.6 Hf	*132706*
475 13.0 Ht	477 10.9 Cy	503 10.9 Pt	504 10.9 Jo	500 8.8 Mc	479 12.0 Ht
476 12.9 Bl	478 10.8 Ch	504 10.2 Jo	505 12.1 Fd	502 8.4 Sh	485 12.0 L

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
S VIR	T APS	U UMI	R BOO	S LIB	U LIB
132706	*134677*	141567	143227	*151520*	*153620a*
487 12.0 Ch	447 12.9 En	502 8.2 Jo	504 8.9 Jo	482 8.6 L	482 14.2 L
490 12.0 Ht	450 12.4 Bl	503 8.8 Pt	509 9.0 Jo	487 8.4 Ch	T NOR
RV CEN	465 11.5 Bl	504 8.6 Sh	512 8.7 Jo	489 8.7 L	*153654*
133155	475 10.3 Bl	505 9.0 Mi	V LIB	S SER	479 12.0 Ht
450 8.6 Bl	475 10.6 Ht	509 8.4 Jo	*143417*	151714	490 12.7 Ht
465 8.2 Bl	479 10.0 Ht	512 8.4 Jo	478 9.5 Cy	478 12.3 Cy	R CRB
475 8.3 Bl	484 9.7 Bl	513 9.0 Ma	482 10.0 L	513 13.2 Ma	154428
475 8.2 Ht	489 9.4 Bl	S BOO	489 10.1 L	S CRB	457 6.0 Cy
479 8.2 Ht	490 9.7 Ht	141954	S LUP	151731	458 6.0 Cy
484 8.7 Bl	495 9.4 Bl	483 12.5 Hi	*144646a*	482 10.7 Fd	461 6.0 Cy
489 8.3 Bl	495 9.4 Ht	485 12.7 Hi	479 11.2 Ht	482 10.0 Ah	462 6.1 Cy
490 8.0 Ht	RR VIR	503[12.5 Pt	490 11.9 Ht	483 10.3 Ah	472 6.0 Cy
495 8.1 Ht	*135908*	RS VIR	X LUP	483 10.6 L	475 6.0 Cy
495 7.8 Bl	485 12.8 L	142205	*144646b*	487 10.3 Ch	477 6.0 Cy
T UMI	Z BOO	450 11.0 Bm	490[12.1 Ht	500 10.5 Ra	478 6.2 Ar
133273	140113	457 11.2 Bm	U BOO	503 10.5 Pt	478 5.9 Ko
490 12.8 Br	510 14.0 Ma	465 11.4 Bm	144918	504 10.6 Jo	478 6.2 Ch
T CEN	Z VIR	478 12.0 Cy	477 11.7 Cy	511 11.5 Jo	480 6.2 Ch
133633	*140512*	511 12.0 Jo	504 10.9 Jo	RS LIB	481 6.1 Ah
431 6.6 Sl	485 11.2 L	V BOO	511 10.4 Jo	*151822*	482 6.3 Ah
450 7.9 Bl	506 10.6 Jo	142539a	Y LUP	479 11.1 Ht	482 5.9 Rb
465 6.4 Bl	511 11.0 Jo	462 9.1 Cy	*145254*	482 11.3 L	482 6.2 Se
475 6.5 Bl	RU HYA	477 9.0 Cy	450 10.0 Bl	489 10.5 L	482 6.3 Ch
479 6.5 Ht	*140528*	479 9.3 Jo	465 9.4 Bl	493 10.5 Ht	482 6.0 L
484 6.2 Bl	450[12.9 Bl	481 9.1 Jo	475 9.5 Bl	495 9.9 Bl	483 6.0 L
489 6.2 Bl	479 13.3 Ht	482 9.4 Fd	479 9.9 Ht	RU LIB	483 6.2 Ah
490 6.4 Ht	484 13.0 Bl	487 9.2 Ch	484 9.7 Bl	*152714*	484 6.0 Ra
495 6.2 Ht	489 13.0 Bl	500 8.8 Ra	489 9.9 Bl	482 13.7 L	484 5.9 Pt
495 6.0 Bl	490 13.0 Ht	502 8.8 Jo	490 9.5 Ht	489 13.5 L	485 5.8 Rb
RT CEN	495 12.7 Bl	502 8.9 Hf	495 9.9 Bl	507 12.2 Pt	485 6.0 L
134236	R CEN	503 9.3 Pt	S APS	R NOR	485 6.1 Gy
450 10.9 Bl	*140959*	504 8.7 Jo	*145971*	*152849*	486 6.0 L
465 9.6 Bl	431 7.5 Sl	507 8.2 Mc	426 10.2 Sl	450 9.5 Bl	486 6.1 Se
475 9.3 Bl	450 8.2 Bl	509 8.7 Jo	431 10.5 Sl	465 10.2 Bl	486 6.0 Wd
479 9.4 Ht	465 7.8 Bl	512 8.4 Jo	440 10.4 Bl	475 10.7 Bl	486 6.1 Kp
484 9.3 Bl	475 7.4 Bl	R CAM	450 10.3 Bl	479 11.0 Ht	486 6.0 Hf
489 9.2 Bl	475 6.8 Ht	142584	465 10.5 Bl	484 11.0 Bl	487 6.3 Ch
490 9.2 Ht	479 7.0 Ht	475 10.3 Ch	475 10.6 Bl	489 11.4 Bl	489 6.0 L
495 9.3 Ht	484 7.0 Bl	480 9.8 Br	475 10.0 Ht	490 11.7 Ht	490 6.0 L
495 9.2 Bl	489 6.7 Bl	481 9.7 Jo	476 10.5 Bl	495 11.4 Bl	490 6.1 Me
R CVN	490 6.5 Ht	482 10.0 Ch	479 10.1 Ht	X LIB	491 5.9 Pt
134440	495 6.3 Ht	485 9.7 Jo	484 10.4 Bl	*153020*	492 5.9 Pt
481 9.2 Jo	495 6.3 Bl	490 9.5 Jo	489 10.5 Bl	482 11.5 L	492 6.1 Ar
481 9.2 Ah	U UMI	491 9.4 Br	490 10.2 Ht	489 11.5 L	493 6.4 Rb
482 9.5 Fd	141567	502 8.6 Jo	495 10.2 Ht	S UMI	495 6.2 Rb
483 9.3 Ah	471 8.3 Ah	509 8.5 Jo	495 10.3 Bl	153378	495 6.0 Me
487 9.8 Jo	477 8.3 Cy	512 8.4 Jo	RT LIB	481 9.7 Jo	496 6.4 Rb
500 10.0 Ra	477 8.2 Jo	R BOO	*150018*	481 9.7 Ra	500 6.1 Ra
502 10.3 Ah	481 8.2 Jo	143227	482 12.7 L	482 10.0 Ch	502 6.0 Wd
503 10.1 Pt	482 8.3 Ah	481 10.6 Jo	489 12.8 L	486 9.0 Jo	502 6.0 Rc
504 10.3 Jo	483 8.3 Ah	481 10.6 Ah	T LIB	502 9.8 Hf	502 5.8 Pt
506 10.3 Jo	484 8.3 Mn	483 10.5 Ah	*150519*	502 9.4 Sh	502 6.2 Ah
511 10.5 Jo	485 7.9 Ch	487 9.9 Ch	482 13.7 L	502 8.8 Jo	502 6.0 Hf
RX CEN	486 8.0 Jo	500 9.6 Ra	489 13.6 L	506 9.8 Wd	502 6.0 Jo
134536	496 8.3 Jo	502 9.4 Hf	503 12.0 Pt	506 9.8 Hf	503 6.1 Me
450[13.1 Bl	500 8.3 Ra	502 9.4 Ah	Y LIB	509 8.8 Jo	503 6.2 Ba
490[13.1 Ht	502 8.8 Ah	502 9.3 Jo	*150605*	512 9.2 Jo	503 5.9 Pt
	502 8.7 Hf	503 9.1 Pt	478 8.5 Cy	512 9.5 Sf	504 6.2 Jo

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R CrB		U Ser		W Her		RR Sco		UY Dra		R Sct	
154428		160210		163137		*165030a*		*175458b*		*184205*	
504	5.9 Mi	507	11.3 Pt	482	11.0 Fd	479	9.9 Ht	482	10.0 Cy	495	5.4 Me
506	6.1 Jo	511	11.5 Jo	487	11.5 Ch	493	8.2 Ht	RY Her		502	5.2 Pt
506	5.9 Pt	SX Her		492	11.8 Ar	RV Her		175519		503	5.2 Pt
507	5.9 Pt	160325		507	12.0 Pt	165631		487	9.5 Ch	503	5.4 Me
508	5.9 Pt	491	8.2 Pt	511	11.4 Jo	507	12.1 Pt	507	9.5 Pt	505	5.2 Pt
509	5.9 Pt	495	8.0 Me	R UMi		509	11.4 Jo	R Pav		506	5.2 Pt
509	6.0 Hi	503	8.0 Me	163172		511	11.7 Jo	*180363*		508	5.5 Pt
509	6.0 Jo	507	8.0 Pt	471	9.7 Jo	R Oph		479	10.8 Ht	509	5.8 Pt
510	6.0 Jo	510	8.0 Me	479	9.6 Jo	*170215*		493	9.6 Ht	510	5.7 Jo
510	6.1 Me	RU Her		476	9.4 Jo	487	11.3 Ch	T Her		510	5.8 Me
511	6.0 Jo	160625		500	9.9 Ra	RT Her		180531		512	6.0 Ma
511	6.1 Gy	472	8.0 Cy	502	9.4 Jo	170627		481	7.2 Ah	512	5.4 Jo
512	6.0 Jo	482	8.2 Cy	502	9.6 Hf	507	9.5 Pt	482	7.3 Cy	Nov Aql	
512	6.2 SR	487	8.2 Ch	506	9.7 Hf	507	9.0 SR	483	7.1 Ah	184300	
X CrB		495	8.3 Me	506	9.7 Wd	509	9.4 Jo	487	7.0 Ch	491	11.5 Pt
154536		503	8.9 Me	507	8.2 Mc	511	9.2 Jo	507	7.8 Pt	RX Lyr	
478	11.3 Cy	507	9.2 Pt	509	9.4 Jo	Z Oph		511	7.9 Gy	185032	
504	9.8 Jo	510	9.3 Me	510	9.6 Mc	171401		W Dra		486	11.6 L
509	9.9 Jo	511	9.5 Gy	512	9.3 Jo	482	12.5 Cy	180565		492	12.7 Ar
512	10.0 Jo	R Sco		R Dra		507	12.0 Pt	472	11.5 Pf	493	12.0 Ch
513	9.8 Ma	*161122a*		163266		RS Her		480	11.8 Pf	507	12.5 Pt
R Ser		450	10.7 Bm	471	12.0 Jo	171723		507	12.5 Pt	S CrA	
154615		457	10.6 Bm	479	11.7 Jo	482	12.5 Cy	X Dra		*185437a*	
472	8.6 Cy	465	11.0 Bm	482	10.8 Ah	507	11.9 Pt	180666		493	12.0 Ht
482	8.8 Ah	479	11.7 Ht	483	10.7 Ah	509	12.2 Jo	472	12.0 Pf	ST Sgr	
483	8.9 Ah	493	12.5 Ht	484	10.1 Mn	511	11.9 Jo	480	12.5 Pf	*185512a*	
487	8.9 Ch	507	12.0 Pt	486	10.6 Jo	S Oct		RY Oph		486	11.8 L
507	9.7 Pt	S Sco		487	10.2 Ch	*172486*		181103		R CrA	
511	10.4 Jo	*161122b*		492	9.6 Mn	426	13.7 Sl	482	10.0 Cy	*185537a*	
V CrB		457	14.3 Bm	502	9.0 Hf	450	12.9 Bl	507	12.0 Pt	493	11.4 Ht
154639		479	12.6 Ht	502	9.1 Wd	465	12.7 Bl	W Lyr		T CrA	
472	9.3 Cy	507	12.0 Pt	502	9.1 Ah	475	12.7 Bl	181136		*185537b*	
504	9.2 Jo	W CrB		502	8.8 Jo	475	12.8 Ht	481	11.4 Ah	493	12.5 Ht
507	9.6 Pt	161138		506	8.8 Hf	479	12.6 Ht	507	9.4 Pt	Z Lyr	
509	8.9 Jo	507	9.0 Pt	507	8.2 Pt	484	12.7 Bl	T Ser		185634	
511	9.0 Jo	509	8.7 Jo	509	8.8 Wd	489	12.3 Bl	182306		486	14.2 L
RR Lib		511	8.7 Jo	509	8.3 Jo	490	11.8 Ht	507	10.6 Pt	507	12.0 Pt
155018		V Oph		512	7.8 Jo	495	11.1 Ht	X Oph		SU Sgr	
507	12.1 Pt	*162112*		RR Oph		495	10.9 Bl	183308		*185722*	
513	13.2 Ma	487	7.6 Ch	*164319*		RU Oph		482	7.3 Cy	493	8.6 Ht
Z CrB		507	7.5 Pt	457	11.6 Bm	172809		486	7.2 Se	RT Lyr	
155229		U Her		465	11.6 Bm	507	9.6 Pt	507	7.3 Pt	185737	
478	9.7 Cy	162119		507	12.0 Pt	511	9.6 Gy	510	7.3 Jo	486	10.0 L
T CrB		481	10.2 Ah	S Her		W Pav		RY Lyr		493	9.9 Ch
155526		482	10.2 Cy	164715		*174162*		184134		R Aql	
507	9.9 Pt	487	9.6 Ch	481	8.5 Ah	440	12.1 Bl	493	12.8 Ch	190108	
RZ Sco		504	8.5 Jo	482	8.2 Cy	479	13.0 Ht	R Sct		481	8.4 Ah
155823		507	8.1 Pt	483	8.7 Ah	495	12.3 Bl	*184205*		483	8.4 Ah
479	10.8 Ht	509	8.2 Jo	487	9.1 Ch	U Ara		478	5.8 Cy	487	8.3 Ch
493	9.6 Ht	511	8.0 Jo	507	10.0 Pt	*174551*		482	5.9 Cy	507	6.8 Pt
507	9.1 Pt	511	8.6 Gy	509	10.0 Jo	479	8.7 Ht	482	5.5 L	V Lyr	
Z Sco		SS Her		511	10.3 Jo	493	10.0 Ht	484	5.6 Pt	190529a	
160021		162807		RS Sco		RT Oph		486	5.5 Se	509	12.3 Pt
479	12.2 Ht	482	9.1 Cv	*164844*		175111		487	5.5 Ch	RX Sgr	
493	11.8 Ht	507	12.0 Pt	479	8.3 Ht	507	12.5 Pt	490	5.3 Me	*190818*	
R Her		W Her		493	8.8 Ht	T Dra		491	5.6 Pt	486	10.6 L
160118		163137		495	9.2 Bl	*175458a*		492	5.6 Pt	493	10.6 Ht
511	12.5 Gy	478	11.4 Ar			482	9.6 Cy	493	5.4 Ch		

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
RX SGR	TZ CYG	TU CYG	S AQL	U CYG	X CEP
190818	191350	194348	200715a	201647	210382
486 10.6 L	493 10.3 Ch	478[11.7 Ry	495 11.0 Me	509 10.2 Pt	442[12.1 Ch
493 10.6 Ht	U LYR	485[12.2 Ch	503 11.1 Me	510 10.0 Jo	480[13.9 Br
RW SGR	191637	509[12.2 Pt	509 10.9 Pt	U MIC	R EQU
190819a	486 11.3 L	X AQL	510 10.7 Jo	*202240*	210812
486 10.4 L	509 10.5 Pt	194604	510 11.0 Me	440 9.4 Bl	488[12.9 L
493 11.0 Ht	AF CYG	509[12.3 Pt	RW AQL	450 8.5 Bl	T CEP
510 10.7 Me	192745	X CYG	200715b	Z DEL	210868
TY AQL	471 7.7 Ah	194632	509 9.2 Pt	202817	447 7.9 Ch
190907	481 7.4 Ah	441 5.5 Ch	510 9.0 Jo	487 11.6 L	471 6.7 Ah
509 10.4 Pt	483 7.6 Ah	447 5.7 Ch	R TEL	509[12.9 Pt	471 7.0 Jo
510 10.2 Me	486 6.9 Se	472 6.7 Cy	*200747*	ST CYG	472 7.6 Kp
512 10.4 Ma	TY CYG	479 6.7 Cy	440 7.5 Bl	202954	472 7.1 Se
S LYR	192928	482 6.8 Ch	450 8.6 Bl	509 10.8 Pt	473 7.1 Se
190925	486 10.3 L	486 7.4 Kp	Z AQL	V VUL	473 7.5 Kp
486[14.4 L	487 10.3 Ch	486 7.2 Se	*200906*	203226	474 7.4 Kp
X LYR	509 10.3 Pt	487 7.0 Ch	509[11.2 Pt	509 8.8 Pt	475 7.4 Kp
190926	RT AQL	487 7.2 L	R SGE	S DEL	475 7.3 Se
509 9.0 Pt	193311	509 7.5 Pt 2	200916	203816	476 7.4 Kp
RS LYR	486 10.7 L	510 7.9 Jo	495 9.0 Me	487 10.8 L	476 6.9 Mn
190933a	R CYG	511 8.5 Gy	503 9.1 Me	509 11.5 Pt	477 7.4 Kp
486 14.3 L	193449	S PAV	510 9.7 Me	V CYG	477 7.3 Se
493[13.1 Ch	442 8.5 Ch	*194659*	510 9.3 Jo	203847	477 7.5 Rb
511[12.0 Gy	471 8.0 Ah	426 7.7 Sl	RS CYG	442[10.9 Ch	477 6.8 Jo
RU LYR	481 8.1 Ah	RU SGR	200938	509 10.6 Pt	478 7.5 Kp
190941	483 8.2 Ah	*195142*	442 9.0 Ch	510 9.7 Jo	478 6.5 Pk
486 10.1 L	487 8.5 Ch	440 9.7 Bl	457 8.9 Cy	T DEL	479 7.2 Se
509 11.5 Pt	509 9.0 Pt	493 7.1 Ht	461 8.4 Cy	204016	479 6.5 Ch
U DRA	510 8.7 Jo	RR AQL	487 7.6 Ch	488 13.1 L	479 7.1 Kp
190967	511 9.1 Gy	*195202*	487 7.6 L	509[12.2 Pt	481 6.7 Kp
472 11.8 Pf	RV AQL	488 9.3 L	509 7.0 Pt	V AQR	481 6.6 Jo
480 11.8 Pf	193509	510 8.9 Jo	510 7.2 Jo	204102	481 6.8 Pk
509 9.9 Pt	487 11.9 L	Nov CYG	R DEL	509 8.5 Pt	481 6.6 Ah
510 9.9 Jo	T PAV	195553	201008	T AQR	482 7.4 Rb
512 9.5 Jo	*192072*	509[12.2 Pt	481 8.5 Ah	*204405*	482 7.0 Kp
W AQL	440 9.4 Bl	RR TEL	483 8.5 Ah	442 8.0 Ch	483 6.9 Kp
191007	450 8.5 Bl	*195656*	487 8.4 L	RZ CYG	483 6.7 Wd
486 12.1 L	460 8.6 Bl	493[12.8 Ht	509 9.0 Pt	204846	483 6.5 Ah
509 12.5 Pt	465 8.6 Bl	Z CYG	SX CYG	427 11.9 Wp	484 7.0 Mn
510 13.0 Me	474 8.2 Bl	195849	201130	430 11.9 Wp	484 6.7 Kp
512 12.4 Ma	479 8.5 Ht	442 9.5 Ch	487 13.7 L	447 12.5 Wp	486 6.7 Kp
T SGR	483 8.9 Bl	448 9.7 Ch	RT SGR	509[12.4 Pt	486 6.3 Jo
191017	488 9.1 Bl	487 11.5 Ch	*201139*	S IND	486 6.5 Hf
486 9.2 L	493 9.2 Ht	509 12.2 Pt	440 7.3 Bl	*204954*	486 6.5 Kn
509 8.0 Pt	494 9.5 Bl	S TEL	WX CYG	440 9.4 Bl	486 7.2 Se
R SGR	RT CYG	*195855*	201437b	450 9.7 Bl	486 6.5 Wd
191019	194048	450 13.1 Bl	457 11.9 Cy	465 10.8 Bl	487 6.8 Kp
486 8.0 L	442 9.4 Ch	493 12.8 Ht	478 12.3 Cy	474 11.5 Bl	489 6.6 Wd
493 8.1 Ht	471 7.6 Ah	SY AQL	487 12.1 L	483 11.8 Bl	492 5.9 Ar
495 8.1 Me	481 7.3 Ah	200212	510 12.5 Jo	X DEL	493 6.4 Ch
509 7.1 Pt	483 7.6 Ah	488 12.9 L	V SGE	205017	496 6.2 Jo
RY SGR	486 7.1 Se	S CYG	201520	488 9.6 L	496 6.9 Rb
191033	487 7.3 Ch	200357	495 11.5 Me	R VUL	497 6.4 Je
493 12.0 Ht	509 8.5 Pt	442[11.1 Ch	503 11.7 Me	205923a	502 6.0 Jo
509 11.5 Pt	510 8.0 Jo	509[12.4 Pt	510 11.5 Me	447 9.5 Ch	503 6.4 Ra
510 10.7 Me	511 8.4 Gy	S AQL	U CYG	TW CYG	504 6.4 Hf
S SGR	TU CYG	200715a	201647	210129	505 6.5 Rc
191319a	194348	442 9.2 Ch	442 10.8 Ch	487 12.8 L	509 6.3 Pt
509[12.2 Pt	442 10.5 Ch	487 10.6 L	478 11.0 Cy		509 6.5 Wd

Variable Star Observations Received During March, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
T Cep	RU Cyg	RS Peg	RW Peg	Z And	RR Cas
210868	213753	220714	225914	232848	235053
510 6.0 Mc	471 8.8 Jo	448 10.6 Bm	427 13.4 Wp	486 10.8 Jo	472[13.7 Ch
512 6.0 Jo	475 8.7 Cy	455 10.8 Bm	448 13.6 Bm	503 10.4 SR	V Cet
Y Pav	477 8.8 Jo	X Aqr	455 13.5 Bm	ST And	*235209*
211570	478 9.0 Ry	*221321*	462 13.0 Bm	233335	476[11.7 Bl
475 5.8 Ht	481 8.9 Jo	448 11.0 Bm	R Peg	449 9.3 Ch	R Tuc
479 6.0 Ht	482 8.9 Ry	455 11.6 Bm	230110	471 9.0 Jo	*235265*
490 6.0 Ht	486 8.7 Jo	S Gru	449 11.0 Ch	472 9.1 Ch	426 10.3 Sl
493 5.8 Ht	510 9.0 Jo	*221948*	472 12.6 Ch	472 8.8 Cy	445 10.8 En
W Cyg	R Gru	445 12.5 En	V Cas	476 8.9 Jo	455 10.8 En
213244	*214247*	456 12.8 En	230759	479 8.8 Cy	473 12.0 Ht
475 6.3 Se	440 11.6 Bl	S Lac	449 9.7 Ch	481 9.0 Jo	479 12.2 Ht
477 6.3 Se	445 11.7 En	222439	475 11.0 Cy	486 8.8 Jo	490 12.2 Ht
478 6.4 Se	450 12.0 Bl	487 10.6 L	481 12.0 Ah	490 8.9 Jo	R Cas
479 6.3 Se	TY Cep	R Ind	484 11.5 B	496 8.9 Jo	235350
482 6.5 Se	215586	*222867*	486 12.0 Kn	504 8.8 Jo	449 11.4 Ch
486 6.5 Se	481 11.5 Br	450 12.8 Bl	488 10.9 Ch	512 9.6 Jo	472 12.4 Ch
S Cep	486 11.4 Br	456 12.0 En	W Peg	R Aqr	483 11.9 Wd
213678	491 11.6 Br	460 12.0 Bl	231425	*233815*	489 12.0 Wd
442 11.5 Ch	TW Peg	465 11.5 Bl	471 8.9 Jo	440 9.5 Bl	496 12.0 Wd
471 9.6 Jo	215927	475 11.2 Bl	476 9.0 Jo	442 9.9 Ch	496 12.0 Hf
474 11.2 Ch	405 7.7 Lt	475 11.0 Ht	481 8.8 Jo	448 9.9 Ch	Z Peg
475 10.3 Cy	417 7.6 Lt	479 10.7 Ht	486 8.5 Jo	450 9.5 Bl	235525
475 9.3 Jo	426 7.6 Lt	484 10.0 Bl	490 8.3 Jo	465 9.6 Bl	471 9.6 Jo
477 9.2 Jo	428 7.5 Lt	488 10.0 Bl	V Phe	475 9.6 Bl	472 10.2 Ch
481 9.0 Jo	442 7.7 Lt	490 9.7 Ht	*232746*	Z Cas	479 9.9 Jo
486 8.8 Jo	446 7.8 Lt	494 9.0 Bl	445 8.8 En	233956	486 10.3 Jo
486 11.0 Gh	464 7.6 Lt	495 9.3 Ht	456 9.0 En	449 11.3 Cy	Y Cas
489 10.6 Wd	474 7.5 Lt	T Tuc	468 9.2 Ht	467 10.9 Cy	235855
496 8.7 Jo	477 7.5 Lt	*223462*	473 9.7 Ht	472 10.5 Cy	472[13.3 Ch
499 10.7 Md	490 7.5 Lt	456 9.2 En	Z And	472 10.9 Mg	SV And
503 10.5 Ra	RT Peg	473 10.7 Ht	232848	472 10.9 Ch	235939
503 8.9 Jo	215934	479 10.9 Ht	472 10.7 Cy	479 10.9 Cy	427 11.4 Wp
509 9.3 Jo	488 9.4 L	R Lac	472 10.8 Ch	484 11.0 B	472 12.8 Ch
512 9.5 Jo	Y Peg	223841	475 11.0 Cy	487 11.4 Jo	480 13.1 L
	220613	449 9.9 Ch	478 10.8 Pk		
	455[13.2 Bm	475 11.8 Jo	479 11.2 Cy		
		487 12.7 L	481 10.7 Pk		

Rapidly Varying Irregular Variables.

Star	J.D.	Est.Obs.	J.D.	Est.Obs.	Star	J.D.	Est.Obs.	J.D.	Est.Obs.
005840 RX Andromedae—					060547 SS Aurigae—				
	7429.7	13.0 Wp	7482.3	12.9 Ry		7450.4	14.7 Bm	7479.7[14.5 Br	
	7471.1	13.3 Ch	7482.6	13.0 Cy		7455.1	14.8 Bm	7480.5	14.0 Ar
	7471.4	12.8 Ry	7483.7	12.7 Br		7458.6[12.5 Cy		7480.6	14.6 Pf
	7472.7	13.1 Br	7486.7	13.6 Br		7459.7[12.5 Cy		7481.6	14.1 Ar
	7474.7	13.4 Br	7489.3	12.1 Ry		7461.7[12.5 Cy		7482.5[13.2 Ry	
	7478.3	11.2 Ry	7490.7	11.0 Br		7462.1[13.9 Bm		7483.3	14.8 L
	7478.7	11.0 Br	7491.7	11.0 Br		7464.6[12.5 Cy		7483.6	14.2 Ar
	7479.1	11.0 Ch	7502.5	13.2 GC		7470.4[12.5 Ry		7483.7	14.1 Ar
	7479.6	11.0 Cy	7503.6	13.1 GC		7471.4[12.5 Ry		7484.7[14.5 Br	
	7479.7	11.3 Br	7503.6	13.1 SR		7472.6	14.1 Pf	7485.6[12.8 Ar	
	7480.3	12.0 Ry	7505.6	12.2 SR		7472.7	14.3 Br	7485.6[12.7 Hu	
	7480.3	11.7 L	7505.7	12.8 Pt		7474.7[13.9 Br		7485.8[12.7 Ar	
	7480.7	12.1 Br	7510.6	11.5 SR		7475.0	14.0 Ch	7486.6[13.9 Wp	
	7481.7	12.9 Br				7475.8	14.0 Hi	7487.7[11.0 Pt	
060547 SS Aurigae—						7477.6[12.5 Cy		7488.6[12.9 Ar	
	7429.6	14.1 Wp	7442.1	11.2 Ch		7478.6	14.1 Ar	7489.4[11.5 Ry	
	7441.0	11.3 Ch	7447.6	14.6 Wp		7478.7	14.7 Br	7490.7[13.9 Br	

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
060547 SS AURIGAE—						
	7491.7	14.1	Br	7504.7	13.0	Me
	7496.4	12.5	Ry	7505.7	12.6	Pt
	7496.7	12.6	Hi	7506.7	12.6	Pt
	7499.7	12.0	Pt	7507.7	12.6	Pt
	7500.7	12.5	Pt	7508.6	13.2	So
	7501.7	13.2	Me	7509.7	12.6	Pt
	7502.6	13.9	GC	7510.7	13.2	SR
	7503.6	14.6	Wa	7511.7	12.5	Jo
	7503.6	14.5	Wp	7512.7	13.2	SR
074922 U GEMINORUM—						
	7431.1	13.3	Sl	7482.6	9.5	Cy
	7441.1	10.4	Ch	7483.6	9.5	Ar
	7442.1	12.3	Ch	7483.7	10.3	Br
	7448.1	12.3	Ch	7483.7	10.1	Pt
	7450.4	13.9	Bm	7484.5	10.6	Mi
	7455.2	13.4	Bm	7484.6	10.5	B
	7457.4	14.8	Bm	7484.8	10.8	Pt
	7458.6	12.4	Cy	7485.1	10.9	Ch
	7459.7	12.4	Cy	7485.3	9.9	L
	7461.7	12.4	Cy	7485.6	10.9	Gy
	7462.9	12.4	Cy	7485.7	10.8	Hu
	7464.6	11.9	Cy	7485.7	10.8	Pt
	7465.5	12.4	Bm	7485.7	10.6	Ar
	7470.0	11.9	Ch	7486.5	11.7	Hf
	7471.1	10.5	Ch	7486.5	11.8	Ko
	7472.1	9.0	Ch	7486.5	12.0	B
	7472.6	8.6	Cy	7486.5	11.7	Wd
	7472.7	9.1	Br	7486.6	11.9	Gh
	7473.1	8.9	Ch	7486.6	11.5	Mi
	7474.1	8.8	Ch	7486.7	12.1	Br
	7474.7	9.2	Br	7487.4	12.5	Ch
	7475.5	8.7	Cy	7488.1	13.0	Ch
	7476.1	8.9	Ch	7488.6	11.0	Ar
	7477.1	8.8	Ch	7489.1	13.7	Ch
	7477.5	9.4	B	7490.7	13.3	Br
	7477.7	9.1	Cy	7491.9	12.4	Pt
	7478.3	9.0	Ch	7492.8	11.3	Ar
	7478.5	9.6	B	7499.7	12.3	Pt
	7478.6	9.2	Cy	7500.7	12.4	Pt
	7478.6	9.0	Ar	7501.7	13.3	Me
	7478.7	9.3	Br	7502.7	12.4	Pt
	7478.8	9.2	Ar	7503.7	13.3	SR
	7478.9	9.3	Ar	7504.7	13.3	Me
	7479.6	9.3	Cy	7505.6	13.3	SR
	7479.7	9.6	Br	7506.7	12.4	Pt
	7480.1	9.1	Ch	7507.7	12.4	Pt
	7480.6	9.2	Ar	7508.6	13.8	GC
	7480.7	9.6	Br	7509.7	12.4	Pt
	7481.6	9.5	Hf	7510.8	14.2	Ma
	7481.6	9.3	Ar	7511.7	13.3	Gy
	7481.7	9.8	Br	7512.7	13.3	SR
	7482.1	9.4	Ch	7513.8	13.9	Ma
	7482.5	9.8	B			
081473 Z CAMELOPARDALIS—						
	7461.7	11.1	Cy	7474.7	13.3	Br
	7462.9	11.3	Cy	7475.1	13.2	Ch
	7470.4	12.7	Ry	7477.7	13.2	Cy
	7471.4	12.7	Ry	7478.7	13.4	Br
	7472.7	13.5	Br	7479.7	13.5	Br
481473 Z CAMELOPARDALIS—						
	7480.1	13.2	Ch	7502.7	12.8	Pt
	7480.3	12.9	Ry	7503.6	13.2	GC
	7480.7	13.5	Br	7503.6	13.3	SR
	7481.7	12.3	Br	7503.7	12.8	Pt
	7482.5	11.1	Ry	7504.7	12.5	Md
	7483.5	10.9	Ry	7505.6	13.1	SR
	7483.7	10.8	Pt	7506.7	12.8	Pt
	7483.7	10.9	Br	7507.7	12.5	Pt
	7484.8	11.8	Pt	7508.6	12.8	GC
	7485.5	11.0	Jo	7509.7	12.5	Pt
	7485.6	11.7	Gy	7510.7	13.1	SR
	7485.7	11.5	Pt	7511.0	13.1	Me
	7486.5	11.7	Ko	7511.7	12.6	Md
	7486.7	11.7	Br	7511.7	12.3	Gy
	7486.8	11.5	Md	7512.6	11.0	SR
	7487.6	11.3	Jo	7513.7	10.4	Md
	7488.7	12.5	Md	7514.7	10.4	Md
	7490.7	13.4	Br	7515.8	10.6	Md
	7491.7	13.1	Br	7516.7	11.5	Md
	7496.4	12.4	Ry	7517.8	11.5	Md
	7499.7	12.5	Md	7518.7	12.0	Md
	7500.7	12.8	Pt	7519.8	12.6	Md
	7501.7	12.5	Pt	7520.8	12.5	Md
	7501.7	13.2	Me			
094512 X LEONIS—						
	7478.8	13.2	Ar	7503.7	13.3	GC
	7479.9	13.5	Br	7506.7	12.6	Pt
	7481.7	13.3	Ar	7508.6	12.3	So
	7483.7	13.3	Ar	7510.7	13.3	SR
	7492.8	13.5	Ar	7512.7	13.3	SR
	7501.7	12.5	Me			
174406 RS OPHIUCHI—						
	7478.9	11.8	Cy	7504.0	11.9	Me
	7482.9	11.9	Cy	7507	11.8	Pt
	7493.6	12.2	Ht	7510.9	12.3	Ma
	7496.0	11.9	Me	7511.0	12.1	Me
202946 SZ CYGNI—						
	7491.9	9.5	Pt	7508.9	9.5	Pt
	7492.9	9.5	Pt	7509.9	9.7	Pt
	7507.9	9.5	Pt			
213843 SS CYGNI—						
	7427.6	12.0	Wp	7481.5	11.9	Jo
	7429.5	12.0	Wp	7481.6	11.6	Ra
	7430.6	12.0	Wp	7481.7	11.5	Ah
	7441.0	8.7	Ch	7482.9	10.2	Cy
	7447.0	8.5	Ch	7483.3	9.8	Ah
	7447.6	8.5	Wp	7483.5	10.2	Rb
	7449.0	8.7	Ch	7483.5	9.6	Jo
	7459.0	11.0	Ch	7485.5	9.5	Jo
	7471.3	11.8	Ah	7486.5	9.4	Jo
	7471.5	11.9	Jo	7487.5	9.4	Jo
	7475.5	11.9	Jo	7487.7	9.4	L
	7475.5	11.8	Cy	7488.7	9.5	L
	7476.5	12.0	Jo	7490.5	9.6	To
	7477.5	11.8	Jo	7490.7	9.7	L
	7477.5	11.5	Rb	7491.0	9.9	Me
	7478.6	11.8	Pk	7491.9	9.5	Pt
	7478.9	11.9	Cy	7492.9	9.5	Pt
	7479.5	11.8	Jo	7492.9	9.5	Ar

VARIABLE STAR OBSERVATIONS RECEIVED DURING MARCH, 1934.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
213843 SS CYGNI—							213843 SS CYGNI—						
	7496.0	10.2	Me	7508.9	11.5	Pt		7510.9	11.2	Ma	7511.9	11.0	Ae
	7497.0	10.9	SR	7509.9	11.7	Pt		7511.0	11.7	Me	7512.9	10.5	Ma
	7504.0	11.6	Me	7510.8	11.2	Ma		7511.8	10.5	Ma	7513.8	10.1	Ma
	7507.0	11.8	SR	7510.9	12.0	Jo							

SUMMARY FOR MARCH, 1934.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Ahnert	Ah	37	109	Luechinger	Lr	3	3
Allen, L. B.	Ae	1	1	Marsh	Ma	26	31
Armfield	Ar	17	64	McKnelly	My	19	35
Baldwin	Bl	68	344	McLeod	Mc	12	17
Ballhaussen	Ba	2	2	Meek	Me	21	48
Bappu	Bm	32	69	Mennella	Mn	9	20
Bouton	B	53	67	Millard	Md	4	18
Brocchi	Br	55	128	Miller, R. W.	Mi	14	23
Brown, A. N.	Bn	2	11	Monnig	Mg	12	13
Buckstaff, R.N.	Bc	1	1	Parthe	Pa	5	13
Chandra	Ch	168	311	Peltier	Pt	150	230
Cilley	Cy	71	140	Perkinson	Pk	11	18
Ensor	En	50	96	Preucil	Pf	8	21
Ford	Fd	19	22	Raphael	Ra	51	55
Georgetown	GC	27	37	Recinsky	Rc	7	7
Gooch	Gh	2	2	Rosebrugh	Rb	8	25
Goodsell	Gs	2	2	de Roy	Ry	8	29
Gregory	Gy	31	40	Salanave	Sx	21	32
Hartmann	Hf	52	107	Scanlon	So	19	27
Hildom, A.	Hi	11	21	Schenkman	Sc	13	42
Houghton	Ht	81	197	Shinkfield	Sl	22	44
Houston	Hu	6	8	Skora	SR	15	39
Jansen	Je	7	15	Smith, F. P.	Sq	11	22
Jones	Jo	125	571	Smith, F. W.	Sf	4	4
King	Kg	4	6	Smith, L.	Sh	19	20
Kirkpatrick	Kp	6	45	Wade	Wh	3	3
Kohman	Ko	15	16	Watson	Wa	10	14
Koons	Kn	3	5	Webb	Wd	50	109
Lacchini	L	116	136	Woods	Wp	15	33
Loreta	Lt	2	15				
				Totals	59	398	3581

bers will continue to participate in our observing program.

Nova (RS) Ophiuchi appears to be rather steady at the twelfth magnitude while before the recent outburst it was about a magnitude brighter. SS Cygni has certainly been "acting up" during the past six months. In October the star passed through an unprecedented double maximum, attaining the tenth magnitude only. After an interval of 70 days, during which the variable remained at minimum, for a time a little below the 12th magnitude, it began a quick rise on December 29 to a normal wide "A" type maximum. The star did not reach normal minimum before a sudden increase to magnitude 10.1 occurred which lasted for a week only. On February 12 it again started to increase in brightness, reaching only to magnitude 9.4, presenting a rare type of anomalous maximum. On March 11 it rose to a "D" 1 type maximum. Surely during the present year SS Cygni has been extremely active, presenting several interesting features.

Sequences and charts are being prepared for observing most of the other SS Cygni type variables, as well as for some of the well-known novae, especially during their faint stages.

LEON CAMPBELL, Recorder.

April 10, 1934.

Meteor Notes from the American Meteor Society

By CHARLES P. OLIVIER, President

These notes are again divided into two distinct parts. The first contains a few comments and a table of radiants; the second is another installment of meteor heights for the Leonid epoch, computed and written up by Mrs. Doris M. Wills.

The radiants given in the accompanying table were received some months ago, but we have been unable to publish them earlier. They make a real addition to the list from the Southern Hemisphere. They were derived by R. A. McIntosh from observations by F. M. Bateson, and reported to us; the maps have not been examined here. As to "confirmations," it is well to remind our readers that we consider one radiant as confirming another if both coördinates agree within 2½ degrees and there is not over a 48-hour difference in date.

RADIANTS.

A.M.S. No.	Date 1927	α	δ	No. of Meteors	Wt.	Remarks
1575	Jan. 10-11	113°.8	—30°	8	V. Good	
1576	Mar. 6-7	237.5	—17	7	Good	See 2780
1577	June 2	243.5	—23.8	3	Good	
1578	June 2-3	277	—33	3	Fair	
1579	June 10	262.5	—38	5	Good	See 2567?
1580	June 24-26	331	—47	5	V. Good	
1581	June 24-26	309.5	—47.5	7	Fair	
1582	June 24-26	284	—40	5	V. Good	
1583	July 3-4	328	—27	6	Fair	
1584	July 19	284	—25	4	Fair	
1585	July 28	348	—58.5	4	V. Good	
1586	Aug. 20-21	345	—29	5	Fair	
1587	Sept. 25	1	—66	1	Good	Stationary meteor
1588	Oct. 18	282.5	—33.2	3	Good	
1589	Oct. 19	33.5	— 6.8	1	Good	Stationary meteor
1590	Oct. 27	18	—36.5	5	Fair	
1591	Dec. 25-26	100	—48	5	Fair	
1592	Dec. 25-26	132	—30	5	Good	
	1932					
2793	July 1.58	329	—45	4	Fair	
2794	July 28.55	340	—17.5	8	Good	δ Aquarids
2795	July 29.51	338	—12	1	Good	Stationary meteor. δ Aquarids
2796	July 29.55	341	—17.5	22	Ex.	δ Aquarids
2797	July 29.55	345	—18	1	Good	Stationary meteor. δ Aquarids
2798	July 29.58	335	—16	8	Good	δ Aquarids
2799	July 29.54	327	—21	10	Good	See 2028?
2800	July 29.61	337.5	— 9.5	7	Good	δ Aquarids
2801	July 29.63	336	+ 2.5	4	Good	See 2751, 1165?, 1166?, 1172?, 1515?

We have received many observations of the fireball which was seen almost due north of New Haven on March 22, and also of the great one over western Canada on March 19. Further observations of either would be gladly received. Paths of four fireballs have been recently completed.

Meteor Heights, 1933 Leonid Epoch

PART II. STATE GROUPS.

By DORIS M. WILLS.

Observations on Leonid dates plotted from stations in the Northeastern Network (New Jersey, New York, and southern New England, under the direction

of R. B. Butler) and in the Wisconsin Network (Wisconsin, and northern Illinois and Indiana, under the direction of L. E. Armfield) have now been examined. The twenty-one computed heights are given in the accompanying tables. The method of computation used is the graphical construction with altitudes and azimuths, as described in A.M.S. Reprint No. 11.

In the Northeastern group, the seven stations from which plots were received were numbered as follows:

1—Trenton, New Jersey, Observer, Frank J. Volz.
2—Princeton, New Jersey, H. A. Burns.
4—Plainfield, New Jersey, R. B. Butler and members of the North Jersey Amateur Astronomical Society.
5—E. Paterson, New Jersey, N. J. Heines and four assistants.
6—Piermont, New York, G. P. Kirkpatrick.
7—Brooklyn, New York, Joseph Stephenson and four assistants.
12—Providence, Rhode Island, Geo. H. Euart and John L. Euart.

From observations on three nights (November 14-15, 15-16, and 16-17) three heights were found. These are given in Table I, the columns in order being date, E.S.T., average estimated magnitude, mean beginning heights and the average deviation from the mean, end height and the deviation from the mean, stations from which the meteor was plotted, and the class of the meteor (Leonid or Sporadic). With better weather, the results from these observers would of course have been greatly increased. The major trouble for this network, however, was not clouds, but imperfect coöperation by a number of the stations. In spite of careful and painstaking organization by R. B. Butler, relatively few meteors were plotted; although 12 stations were planned, only the Plainfield, East Paterson, Piermont, and Providence observers sent in reasonably complete plots and record sheets for their oberving times.

For the Wisconsin network, the organization was more complicated. Ten stations were occupied:

1—Milwaukee, Wisconsin. Observers: Milwaukee Astronomical Society, under the leadership of the Regional Director, L. E. Armfield. The following members were also named on the record sheets: E. A. Halbach, A. F. Boyd, C. P. Frister, F. Dieter, Wm. Liebscher, A. L. Peck, C. C. Steven, Miss E. Wright, H. L. Grunwald, J. Gamroth, and C. Siettmann.
2—Beloit, Wisconsin. Students at Beloit College, under the leadership of Professor R. C. Huffer.
3—Madison, Wisconsin. Schinke, Newlin, and W. Houston, at Washburn Observatory, under the leadership of Houston.
4—Marshfield, Wisconsin. E. R. Reich.
5—Reedsburg, Wisconsin. V. J. Niebuhr.
6—Watertown, Wisconsin. Godfrey Club, under the leadership of Hans D. Gaebler. Edward Kuenzie and John Brennan were also named on the record sheets.
7—Crawfordsville, Indiana. V. Robinson.
8—Joliet, Illinois. Frank Preucil, of the Joliet Astronomical Society.
9—Oak Park, Illinois. Edwin P. Martz, Jr.
10—Chicago, Illinois. Armin Deutsch. Additional Chicago observations were planned but no reports received.

For most convenient work in getting duplicate paths, these stations were divided into six observing groups; for the stations in central positions, this grouping necessitated having observers facing in at least two directions. The groups were as follows:

Group No.	Coöperating Stations
1	2, 8, and Chicago observers.
2	1, 2, 3, and 6.
3	1, 2, and 5.

4	1, 9, and 10.
5	4 and 5.
6	7, and Mattoon, Illinois.

As no report was received from the Mattoon observer, Group 6 necessarily yielded no heights. Although the stations of Group 4 did send in reports, there were no time-coincidences for plotted meteors. Eighteen heights computed from observations by Groups 1, 2, 3, and 5 are given in Table 2, the group number being given in parentheses after the station numbers. Observations from Station 1 of Group 2 were used not only with that Group but also with Group 3, as the sky regions somewhat overlapped.

TABLE I.

NORTHEASTERN NETWORK.

No.	Date 1933 Nov.	Time E.S.T. h m s	Ave. Est. Mag.	Beginning Height km.	End Height km.	Stations	Class
1	14-15	14:23:41	1.5	.. ..	145±11	6, 12	S
2	14-15	15:03:30	—0.5	98±18	82 11	4, 6	S?
3	16-17	14:39:15	1.5	112 15	92 3	6, 12	S?

TABLE II.

WISCONSIN NETWORK.

No.	Date 1933 Nov.	Time E.S.T. h m s	Ave. Est. Mag.	Beginning Height km.	End Height km.	Stations	Class
1	14-15	12:14:26	1	130±30	94±38	4, 5 (5)	S
2		12:45:05	3.5	53 13	38 15	4, 5 (5)	S
3	15-16	12:12:21	0.5	80 18	80 1	2, 3 (2)	L
4		12:25:32	1	168 12	116 17	4, 5 (5)	L
5		13:16:13	1.5	95 19	69 15	4, 5 (5)	L
6		13:16:56	3.5	40 1	38 2	4, 5 (5)	L?
7		13:18:44	3	87 6	46 10	2, 8 (1)	L
8		13:22:50	1	117 2	55 4	2, 8 (1)	S
9		13:28:24	2	147 24	46 11	4, 5 (5)	L
10		14:24:34	2	152 22	90 2	2, 8 (1)	L
11		15:38:51	0.5	119 23	63 10	1, 2 (2)	L
12		15:50:03	3	30 3	24 0	1, 2 (2)	L?
13		16:07:25	2	68 25	67 5	1, 2 (2)	S
14	16-17	12:44:40	2	132 16	114 24	1 (2), 5 (3)	S?
15		12:49:27	3	91 2	.. ..	1, 2 (3)	S
16		12:53:45	1	102 11	91 5	1 (2, 3), 2 (2, 3)	L
17		13:47:42	3	126 33	124 2	1 (2), 5 (3)	L
18		13:56:58	1	128 11	82 15	2, 8 (1)	S

The observers throughout this network deserve special commendation for coöperating so faithfully in the detailed observing plans made by their organizer, L. E. Armfield. The process of computation made it obvious that although the resulting list of heights is not long and some of the deviations are large, the observers were unusually careful in following instructions about directions in which the observations were to be made. For the meteors plotted on the three nights of observation there were 32 time coincidences. Only 3 of these could be immediately eliminated because the observed paths were in discordant directions as entered on a map of the stations; and even these 3 were on the edges of the assigned areas. The remaining 29 were computed, but for 11 of them the heights from the contributing stations were so extremely discordant as to make it obvious that the meteors could not have been the same. The 18 given in Table II include a few unusually low heights and a few unusually large deviations. Considering the relative inexperience of many of the observers, it seemed wiser to us not to attempt

to discard anything except obvious non-duplicates. The Wisconsin observers show much promise, and with additional experience should become an excellent source of careful and precise observations.

Some heights have already been computed by S. Bunch for the Leonid observations made in his Kentucky-Tennessee region. The Florida data are being handled by J. H. Kusner in Gainesville. Computations are now being undertaken here for the remaining Kentucky-Tennessee data, and for observations from Colorado and Ohio. The results will be published in these notes as soon as possible.

Flower Observatory of the University of Pennsylvania,
Upper Darby, Pennsylvania, 1934 April 23.

Meteorite or Whirlwind in Spain

By C. C. WYLIE

The story of a meteor setting fire to a house in Spain appeared in Associated Press stories of date February 22, 1934. The dwelling destroyed was near La Rinconada, not far from Seville, Spain. The press report stated that a hum like an airplane was heard, that a cloud of smoke was seen, and that an explosion was heard. It appeared possible, though not probable, that a meteorite had struck the house and indirectly caused the fire. We, therefore, wrote to the Observatory at Madrid, Spain, and to the American Vice Consul at Seville.

Dr. V. F. Ascarza of the observatory and Mr. John B. Ocheltree, American Vice Consul at Seville, both replied promptly. Dr. Ascarza stated briefly that the information received rendered improbable the story of an important meteoric fall at La Rinconada.

Mr. Ocheltree, the American Vice Consul, reported that the dwelling destroyed was not a house, but a thatched hut. (Probably the hut was of grass or straw.) The day was clear. The ruins had been carefully searched for the supposed meteorite, and a stone weighing 29 grams, apparently of iron oxide, was found at a depth of 50 centimeters. Mr. Ocheltree also sent a clipping from a Spanish newspaper, which gave the story as related by Francisco Mejias, the owner of the hut. This story follows:

> "It must have been a little after noon on the seventeenth of February. My wife had gone to Seville with some of the children. The oldest boy was watering the animals and I was in the hut with my son, Pedro. We were seated around the cot ready to eat. (The family apparently used the cot as a table also.) Suddenly I heard a strange noise. My son thought it was an airplane flying low and went out of the hut. Almost immediately I heard him say 'Papa, look!' I went out of the hut, and found myself within a black cloud. I was overcome and fell to the ground. My cap was violently torn from me and lost.
>
> "The dust cloud made a black column which extended, strange to say, in a direction against the strong wind which was then blowing. It seemed to rapidly take fire.
>
> "Of the hut only the posts remained. The furnishings were totally destroyed by the fire. The cup of a charcoal brazier, recently bought, was melted into several pieces and mixed with other material. The beam of a plow fifty meters from the hut was scorched, as were also some olive trees around the hut. It was simply an accident we were not in the hut. We would certainly have been killed."

The letters indicate that a violent windstorm, accompanied by a cloud of dust, struck the dwelling. The dust storm seems to have been of very short duration, and quite local. Apparently none of the neighbors noticed it. Also, the wind

came up suddenly and without warning on a clear day. The hut evidently collapsed. The burning charcoal, scattered from the brazier, kindled the dry grass of the thatch, and a hot fire resulted. Only the posts of the hut were left.

In attempting to explain this incident, let us say first that there evidently was no meteoric fall at that time. No one saw or heard the phenomena which usually attend the fall of a meteorite. The stone recovered was buried too deply for a meteorite of that weight.

The first thought of the average American reading the account would probably be a small tornado. The tornado theory is, however, ruled out, by the clear day. There are, however, fair-weather whirlwinds of considerable violence. We have occasionaly seen dust whirls which would undoubtedly cause much damage to a hut of grass or straw. These whirlwinds are related to tornadoes, and are occasionaly quite violent. At sea, ships have been stripped of sails and masts by such whirls appearing suddenly in dry weather.

We suggest, therefore, that a dust whirl was responsible for the destruction of Mejias' hut. We have written to Professor D. Pedro Castro, Department of Natural History of the University of Seville, asking whether investigation confirms this. We have also requested from him a geologist's report on the stone recovered.

University of Iowa, April 17, 1934.

Notes from the Society for Research on Meteorites

Edited by FREDERICK C. LEONARD, President, and H. H. NININGER, Secretary

On the Fall of a Brilliant Meteor*

By C. C. WYLIE

In the autumn of 1926, the University of Iowa Observatory began intensive work on the study of meteors. It was decided at that time to specialize on spectacular fireballs, bright enough to cast shadows and to attract the attention of the public generally. Professor C. P. Olivier, President of the American Meteor Society, and others, had already recommended dividing the United States into sections for fireball work. We therefore began the organization of a group for intensive work on spectacular fireballs falling in any of the Middle Western States. In the summer of 1927, the group was organized as *The Midwest Meteor Association*. Its membership was made up largely of college professors in Iowa and adjoining States, although a few amateur astronomers not connected with colleges have been actively coöperating with us.

Following the example of Dr. W. J. Fisher of the Harvard Observatory, we gave notes to the newspapers and to the Associated Press when spectacular meteors fell. From the very first, however, we have endeavored to base our computations as far as possible on personal interviews rather than on results obtained by correspondence. To do so, we have found it advisable to concentrate our efforts on meteors bright enough to cast shadows. It is not difficult to find many observers of the most spectacular meteors, those which light up the landscape, and which attract the attention of almost anyone outdoors and away from lights. We have endeavored to get into touch also with interested persons in communities scattered over the Middle West. When a spectacular meteor falls, we write to

*The substance of an address delivered before the organization meeting of the Society, held at the Field Museum of Natural History, in Chicago, Illinois, on August 21-22, 1933. This address was illustrated by lantern slides.

members of our organization in the area where the meteor attracted the most attention, and ask them personally to interview people in their respective communities who saw the meteor. Interviews are made, as far as possible, with the person standing exactly where he was when he saw the meteor. For three meteors dropping meteorites, the writer personally interviewed observers, both near the point of fall, and fifty or more miles away.

Since we began this work, we have naturally given the most attention to detonating meteors, from which there is the best chance of recovering meteorites. In the course of this period of time, the following meteoritic falls have been authenticated in the United States:

Tilden, Illinois, July 13, 1927.
Bald Mountain, North Carolina, July 9, 1929.
Beardsley, Kansas, October 15, 1929.
Paragould, Arkansas, February 17, 1930.
Miller, Arkansas, July 13, 1930.
Archie, Missouri, August 10, 1932.
Harding County, New Mexico, March 24, 1933.
Athens, Alabama, July 11, 1933.

For the Tilden, Beardsley, Paragould, and Archie meteoritic falls, the path of the fireball has been investigated. We did not learn about the Miller fall until it was too late to do anything worth while. The Tilden fall occurred in daylight, and it was cloudy in the vicinity of Tilden. However, the writer succeeded in personally interviewing three observers of the fireball, and the path is without doubt reasonably well determined.

The Beardsley fall occurred at some distance from Iowa City, and the meteorites were not found immediately. Our determination of the path of this meteor is therefore based entirely on information obtained by correspondence. The path is without doubt approximately correct, but is less certain than the others.

For the Paragould fall, the writer personally interviewed observers of the meteor in three States. Several days were spent in the vicinity of Paragould, and we consider the path to be very well determined.

For the Archie fall, we have personally interviewed many observers of the meteor. Mr. H. H. Nininger of the Colorado Museum and Professor E. S. Haynes of the University of Missouri, interviewed several additional observers. The path should be very well determined.

The path of the Harding County meteor is being worked out by Mr. Nininger. It was cloudy in Alabama on July 11, 1933, and so we have been able to find no observers of the Athens meteor.

In addition to the path through the atmosphere, we have, for the more important meteoritic falls, investigated the other phenomena, such as the sound accompanying the fall, the mapping of the points of fall for the meteorites recovered, and the depth of the hole made in striking. The information must nearly always be obtained from people without special training in science, and always from persons who were surprised and startled by the phenomenon. To separate fact from fancy, we have consulted with the physicists and the psychologists. A study in this way of the information obtained by personal interview yields much which is of help in interpreting data obtained by correspondence. To illustrate this work we will discuss briefly one of the errors investigated.

There is a psychological tendency to draw the path of the meteor too long. This tendency is revealed, not only in the information obtained by correspondence, but also, to a lesser extent, in that secured from personal interviews.

Our work on the meteor of July 25, 1929, revealed this error quite definitely. Professor Olivier, in his computation, carried the path down to an altitude of only about seven miles. His determination of the path was based altogether on information obtained from correspondence, and chiefly on information obtained from Chicago. In our own determination of the path, we found considerable discordance in the reports, although practically all used were obtained by personal interview. However, where the point of disappearance was well marked for an intelligent observer, the reports agreed well. The selected reports included accounts of disappearance over the middle of a street known to run east and west, disappearance in a small area of sky between two buildings, observations through a window, and other similar observations, from which the psychological element was presumably almost entirely absent. These reports agreed also with the only report which we were able to obtain from an observer within a few miles of the point of disappearance. Our adopted height at disappearance is twenty-five miles, which agrees better with the fact that no detonations were heard.

A similar discordance appeared in the interviews concerning the Paragould meteor. For the interviews near Paragould most of the observers did not have the point of disappearance marked as well as one could wish. Not many persons were about at four o'clock in the morning. But fortunately, from locations so close to the real end point, the psychological error had little effect, and the end point determined was near the place where the meteorites were found. For the more distant interviews the effect was quite noticeable; for example, all of the St. Louis interviews carried the path well past Paragould.

The only meteor listed in Farrington's catalog of meteorites, for which the approximate path was computed, is the Amana, or Homestead, Iowa, meteor. The meteorite fell about twenty miles west of Iowa City on the night of February 12, 1875. The path was computed at once by University of Iowa men, and was continued about twenty-five miles beyond Amana. Consequently, considerable time was spent in searching twenty-five miles beyond where meteorites (more than eight hundred pounds) were later recovered. The logical explanation is that the observers continued the apparent path of the meteor too far, as we find to be the case in modern times, and so misled the University men. From the published articles on this meteor, it appears that the investigators did not know of the effect, and naturally made no effort to correct for it.

For the recent Harding County meteor, it appears that Mr. Nininger has found the same effect. A few days after the fall of the meteorite, he made a preliminary estimate of the height of the end point of the path of the meteor. This estimate, sent in a personal letter, was six to eight miles. Later, from personal interviews, Mr. Nininger computed the height of the end point to be seventeen miles—more than twice as great as the original estimate.*

The University of Iowa Observatory, Iowa City, Iowa.

The Meteoric Display of February 12, 1934: A Preliminary Report

By H. H. NININGER

A remarkable meteoric display occurred about 9:20 o'clock, M.S.T., on the evening of February 12, 1934, visible from the States of Nebraska, Wyoming, Montana, Idaho, Utah, Colorado, Kansas, Iowa, and South Dakota. This flight was unusual in several particulars as follows:

*See the first article in these *Notes* in the February, 1934, number, pp. 105-6. —EDS.

1st: The meteor or meteors continued luminous through a much longer arc than is commonly the case, coming into visibility at least as far west as eastern Idaho or southwestern Montana and continuing visible as far east as eastern Nebraska—over a distance of not less than 700 miles. The extreme limits have not yet been definitely determined. The meteor may have come into view at a point even farther west than has been indicated.

2nd: The flight was peculiar also in its multiple nature. It consisted of not less than three distinct units during the latter half of its visible course. These units traveled, not in a procession, but in a more or less fixed formation.

3rd: The flight was much slower than is the movement of ordinary meteors, being only about 3¼ miles per second in the middle part of its visible course, where it was timed very carefully by a competent observer through a distance of about 160 miles.

4th: All observers who have been interviewed agree that the meteor was not sufficiently bright to light up the landscape noticeably. Even those who were near the course compare the light to that of Venus at her best, but state that the meteors were apparently larger than the planet. This circumstance seems a bit strange in view of the fact that the flight was visible from points as far as 400 miles south of its course. It is probable, indeed almost certain, that the earlier half of the flight was more brilliant than the latter half. It is probable also that the three fireballs seen by the observers interviewed, had resulted from the disruption of a single mass, the disruption occurring at about the mid-point of the luminous flight; however, this matter has not yet been settled.

5th: No noise was heard by the numerous witnesses interviewed along the line of flight between Torrington, Wyoming, and Burwell, Nebraska, with the exception of two persons in Burwell.

The three meteors which traveled together through the last 200 miles gradually grew dimmer until their redness faded out at an altitude which has not yet been definitely determined but which is known to have been several miles above the ground. A bright moon and the meteor's slow movement would certainly in part account for its reduced luminescence.

As he interviewed the numerous witnesses to this phenomenon, the writer was impressed by its resemblance to "The Meteoric Procession of February 9, 1913," as reviewed by William H. Pickering in POPULAR ASTRONOMY, Vols. 29 and 30, 1921 and 1922. Both phenomena resemble each other very closely as concerns the time of year, time of day, direction of flight, velocity, luminescence, and angle of descent. Both were multiple meteors and both were of unusual duration.

No fragments from this fall have as yet been reported.

Do the unusual displays of February 9, 1913, and of February 12, 1934, have any special significance, or do they bear any relation to each other?

A Growing Interest in Meteorites

By H. H. NININGER

In February and early March, the Secretary of the Society for Research on Meteorites made a tour of several Eastern States, visiting a number of universities, colleges, and museums, in the interest of meteoritic research. Six public lectures were delivered, and in twenty-four institutions the Secretary conferred with the heads of departments where interest had been shown in meteorites.

Lack of time and severe weather conditions prevented his reaching a number of institutions which had been originally included in the itinerary; but in those institution visited there was evidenced a growing interest in the program of re-

search which was suggested at the organization meeting of the Society for Research on Meteorites in Chicago, on August 21 and 22, 1933.*

It becomes increasingly evident that we are passing through a period of transition from an attitude in which meteorites have been regarded as interesting objects to be described and preserved, to one in which they are recognized as units in a rapidly growing body of facts which will sooner or later form a basis for some of our most basic concepts regarding the earth as well as the extra-mundane universe. Special interest was shown in the recent additions to our knowledge concerning meteorite craters in Australia, Arabia, Siberia, and the United States. The noteworthy and much discussed Meteor Crater of Arizona has at last been forced to share the attention of the scientific world with the craters at Henbury, Australia, those of Wabar, Arabia, the Carolina "Bays," the Odessa, Texas, crater, and perhaps even more than any other, the little "Buffalo Wallow" meteorite crater recently excavated near Haviland, Kansas.

A chief item of interest and a source of much discussion was the remarkable photograph of the meteor of March 24, 1933, taken by Mr. Charles M. Brown, of Mt. Dora, New Mexico, which was exhibited as a lantern slide projection. Other photographs, not of the moving meteor, but of its persistent train, were exhibited as the work of Mr. C. R. West of Timpas, Colorado, Mr. Bert Latham of Dalhart, Texas, and Mr. H. A. Brooks of Albuquerque, New Mexico. These photographs have proved of great value in our better understanding of meteors and their trains, and emphasize the importance of the ordinary camera in the hands of the layman as an aid to the science of meteoritics.

The importance of a representative collection of meteorites in every institution of higher learning was repeatedly stressed by men connected with institutions in which such collections are lacking, and it was pointed out that the majority of our college graduates, even those who major in astronomy or geology, leave our institutions without having acquired sufficient knowledge to enable them to recognize a meteorite when it is met with outside of a labelled collection. It has been noted that in institutions where collections of meteorites are well exhibited, these collections are occasionally augmented by the discovery of new meteorites in the field by students who have familiarized themselves with the exhibits.

The Secretary returns to his office much inspired by the evidences of increased interest and activity in the subject of meteorites.

The Second Annual Meeting of the Society

The Second Annual Meeting of the Society will be held in conjunction with the summer meeting of the American Association for the Advancement of Science, at the University of California, in Berkeley, on June 18 and 20, 1934. There will be two sessions a day, a morning and an afternoon session. The morning sessions will convene at ten o'clock and the afternoon sessions at two o'clock. Any persons who wish to join the Society at the time of the meeting are invited to attend it, and others who are interested in the purposes and activities of this organization, as well as friends of members, likewise will be welcome. The regular sessions of the Society will be open to the public.

Members who plan to present papers at the meeting, and chairmen of committees who will have reports to make of the work of their committees, are requested to send in the titles and an estimate of the time required for the delivery of their communications, to the Secretary, by June 1 at the latest, in order that

*See these *Notes* in *P. A.*, **41**, p. 521, November, 1933.

these items may be listed on the program. Members who are inclined to contribute to the program are asked to do so, regardless of whether they can attend the meeting or not; members or chairmen of committees who will be absent but who desire to submit papers or reports, may forward them for delivery, either to the Secretary or to some member of the Society who will be present (chairmen of committees, unable to be at the meeting, should send in their committee reports either to the Secretary or to some member of their committee who will be there to represent the committee). The Secretary will appreciate being informed by any member who expects to come to the meeting. It is hoped that there will be a good attendance.

The headquarters of the Berkeley meeting of the Society will, through the kindness of the Director, Dr. A. O. Leuschner, be at the Students' Observatory of the University of California.

New Committee Appointments and Personal Note

The following Committees of the Society have been appointed by the Executive Committee of the Council:

Classification: L. J. Spencer (Chairman), W. F. Foshag, T. T. Quirke, and A. N. Winchell.

Relations between Meteors and Meteorites: W. F. Foshag (Chairman), E. A. Fath, E. S. Haynes, F. R. Moulton, and C. P. Olivier.

Meteoritic Features of the Earth's Surface: E. H. Sellards (Chairman), G. M. Butler, J. D. Figgins, L. J. Spencer, and H. O. Whitnall.

The name of W. H. Fulweiler should be added to the list of members of the *Committee on Discovery, Identification, and Analysis,* announced in the *Notes* in the current April issue.

Dr. Walter T. Whitney, Director of the Brackett Observatory of Pomona College, Claremont, California, and a Councilor of the Society, delivered an illustrated lecture on "The Observation of Meteors in Flight," under the auspices of the Department of Astronomy, at the University of California at Los Angeles, on the afternoon of March 21, 1934.

Secretary's Address: The Nininger Laboratory, 1955 Fairfax Street, Denver, Colorado.

Editors' Address: Department of Astronomy, University of California at Los Angeles.

Meteor Notes from Berea College

The members of the class in astronomy at Berea College, taught by Professor W. R. Hutcherson, carried out a systematic program of meteor observations during the week of March 13-19. Clouds interrupted the work considerably but some results were secured.

Mr. W. R. Wagner reported 62 observed during the week.

Mr. John Thomas reports for the night of March 16: "Out of the 21 meteors, I observed 12 going out of Leo and 9 out of Ursa Major. Most of those coming out of Leo went toward Ursa Major with only a few going toward Gemini or some other direction. Those coming out of Ursa Major went in all directions except in the direction of Leo. The above data are more or less minimum figures, especially in regard to the trails which the meteors left. As for brilliancy and frequency they were somewhat disappointing. The best one was one which came out of Leo and ended in Canis Minor. It lasted 2-3 seconds and left a trail of at least 25°-30°."

For the night of March 17: "The meteors tonight were disappointing altogether. The sky was beautiful, clear, and full of stars. However, there was no indication of many meteors; the few that were seen were very faint with the exception of one."

M. Joyce Medlock observed ten meteors on March 13 and seven on March 16.

Anne Bell McLaughin and Patty Ritchie observed nine on March 14.

In general the meteors were faint and without any spectacular features.

Meteor Program at Little America

The schedule for observations sent out by Dr. T. C. Poulter (*P.A.*, Vol. 41, p. 282, May, 1933) will be followed as was planned. In addition to this schedule, observations should be made during the nights of the maximum of the meteor showers. Since reaching Little America Dr. Poulter has decided to add those dates listed in Bulletin No. 5 of the New Zealand Astronomical Society by R. A. McIntosh.

A complete list of dates is being prepared for all observers and will be mailed within a few days. This list will also be published in the "Meteor Notes" of POPULAR ASTRONOMY. One zenith and four forty-five degree reticles have been mounted on top of the buildings at Little America and all the dates will be covered on a twenty-four hour schedule. This program will add to the value of any observations made at hours other than those listed in the program.

Copies of all observations should be mailed to Raymond E. Crilley, Byrd Antarctic Meteor Program, at Mt. Pleasant, Iowa. All requests for supplies, blanks, schedules, and questions concerning the work will be cared for from these headquarters. Additional observers will be welcomed. They should write at once for supplies and schedule of dates.

Dr. Poulter sends his greeting and regards to all coöperative observers and to his many friends.

Light of Meteor Dazzles Watchers

Under the above title the *Spokane Daily Chronicle* of March 19 contained a communication from Edmonton, Alberta, as follows:

"Flashing its brilliant, greenish light over scores of square miles, a huge meteor burned a pathway from the heavens to the earth last night and today its fragments were being sought in Saskatchewan and Alberta.

"It illuminated the sky at Saskatoon to far outshine the municipal airport's beacon. It was viewed from Calgary and a score of places. But it was believed to have exploded and disappeared in dust somewhere about 100 miles southeast of here, where houses were reported rocked by the explosion.

"A number of residents at Walla Walla, Washington, as well as at Lewiston, Idaho, reported seeing the large meteor which was reported by Edmonton, Alberta, and Calgary, Alberta, to have 'exploded' over Alberta."

Notes from Amateurs

Astrolab Progress Report

Astrolab has been devoting much heavy thought to the problem of comfortable eyepieces. In cold weather a metal eyecap is *cold*. A non-conductor of heat would be superior. The comfort of an eyecap is also determined by its shape. In a cup of proper depth the eye is at the proper distance when the eye just touches

the cap. Thus the cap helps to center the eye and acts as a shield for stray light which might slip past the rim of a flatter eyecap. If possible—and it is possible except in eyepieces of very short focus—there should be room for the observer to blink his eyelashes. We are conducting experiments with a material such as the new fountain pens are made of, a material which can be made in bright colors, which is a low conductor of heat, and which will not break if dropped on a cold pavement. Maybe we shall "color code" the focal lengths of the oculars: red, long wave-length, represents the long focus, violet, the short wave-length, represents the short focus, and so on. The new wide field low power eyepiece is already equipped with eyecaps of this new material and of sufficient depth to permit blinking of lashes.

We have recently had the pleasure of seeing an optical flat which was made on low expansion glass, and had been corrected to one-sixth wave-length. This Astrolab flat is to be used for checking small flats for diagonals to be used on Newtonian Telescopes. Such diagonals will be aluminized instead of silvered because of the non-tarnishing characteristics of aluminized surfaces.

There is considerable loose talk about making telescope mirrors in a relatively short time. It occasionally happens that "Lady Luck" smiles on a mirror maker so that an accurate parabola results quickly, but for every mirror that is made quickly there will be another which takes an exceptionally long time to bring to the proper curve. Most telescope mirrors will take from one hundred to four hundred hours to complete. It must be remembered that there are all degrees of accuracy of the curved surface. What would suit one man at one hundred hours another would continue to refine. For example, many mirror makers would be satisfied with a total error of focus of say one-tenth inch, a more particular mirror maker, however, might figure a mirror to a total of aberrations of one-hundredth inch by carefully using the zonal test, using narrow zones.

Some recent notes we have checked over on an 11-inch mirror made by W.A.M. indicate total aberrations of only three-thousandths inch. This means that a total difference of the focal length of the mirror would be less than the thickness of this sheet of paper. In order to preserve this accuracy from changes caused by temperature, such a mirror must be made on low-expansion glass. In addition to the insurance caused by the composition of the glass, the disc on which this mirror was made is especially designed to adjust quickly to the temperature changes to which a telescope mirror is constantly being subjected.

Is such an accurate mirror necessary? In gathering the light from a star so many light years distant, any change from the focus tends to blur the image ever so slightly, and no one who has seen the stars in a telescope which gives truly sharp images of every tiny point of light in the heavens can fail to emphasize the importance of such accuracy.

Many observers using such a telescope have had their mild interest kindled to enthusiasm by the clearness and sharpness of the images revealed—in a mirror of less quality their beauty might have been lost and in so losing another constant watcher of the skies is lost to Astronomy. The magic of making the eye seven hundred to two thousand times as powerful is the magic of the telescope.

Astrolab, a coöperative group interested in the advancement of Astronomy through the development and production of optical equipment, invites your correspondence. For additional information see previous issues of POPULAR ASTRONOMY and write to

L. I. BUTTLES.

10728 S. Artesian Avenue, Morgan Park, Chicago.

Amateur Telescope Makers of Chicago

The Amateur Telescope Makers of Chicago held their monthly meeting in the Adler Planetarium and Astronomical Museum on Sunday, April 7.

Professor Arthur Howe Carpenter opened the meeting and Leroy Clausing demonstrated by means of a photometer the difference in reflectivity of different coatings of mirrors. It was found that a new silver coat and an evaporated aluminum coat were equal in reflectivity. With the red filter the reading for aluminum was 33, silver 33, and chromium 10. With the blue filter aluminum registered 23, silver 19, and chromium 12.

Mr. Clausing then described the evaporating and sputtering processes and answered questions regarding them. No attempt was made to find exact percentages of reflectivity as the tests were made in the open and the photometer readings were no doubt affected by reflected light from surfaces other than the mirrors.

WM. CALLUM, *Secretary.*

1319 W. 78th Street, Chicago, Illinois, April 15, 1934.

The Joliet Astronomical Society

The Joliet Astronomical Society, organized in the fall of 1932, under the leadership of Robert L. Price, astronomy and physics instructor in the Joliet Junior College, is completing its second year with growing enthusiasm. Programs last year were devoted to amateur telescope making talks and general lectures by members of the Joliet Township High School and Junior College faculty. Dr. John J. Hopfield of the Division of Basic Sciences of the Century of Progress Exposition was the guest speaker of the year, speaking on "Cosmic Rays." The year's program ended with a banquet and an address by the retiring president, Mr. Price.

This year the work of the society has been under the direction of Frank M. Preucil, present president, who has interested the group in meteor observations. Guest speakers have been, Dr. Eric Carlson of Porter, Indiana, Professor C. C. Wylie of the University of Iowa, Professor Oliver J. Lee of Northwestern University and Professor Clarence R. Smith of Aurora College. The Physics Department of the Township High School and Junior College will conclude the biweekly lecture series with demonstrations and short talks on the nature of light.

Joliet, Illinois.

WM. W. SCHOFIELD, *Secretary.*

Sun's Disc Shows Unusual Feature.—On April 6, about 5:00 P.M., using a 5¾-inch Alvan Clark refractor, with dark red glass filter on a solar eyepiece, I was observing the sun for sunspots. I found no sunspot at that time but was surprised and interested to discover an irregular white line, appearing against the red disc of the sun, near but definitely within the outer circumference, at a position corresponding to about 2:30 or 3:00 o'clock on the dial of a clock. I watched the line some time, or rather a number of times, over a period of about a half an hour. The lower part of the line seemed to change somewhat in shape and position during that period.

I will be glad to know whether you have heard of any other observers noticing this unusual marking on the sun at the time referred to. I am sure that the appearance of the object was approximately as above reported. I called my wife on account of the unusual character of the marking, and she made one or two observations of it with me, verifying my own observation.

My surmise is that what I saw was a hydrogen prominence of such unusual

intensity as to be visible within the circumference of the sun, against the darker color of the surrounding area as seen through the red glass filter of the solar eyepiece.

ADRIAN WILLIAMSON.

Monticello, Arkansas, April 21, 1934.

Zodiacal Light Notes

By FRANKLIN W. SMITH

During recent weeks the conditions under which the evening Zodiacal Light must be observed have gradually become less favorable. The Milky Way is now approaching the western horizon shortly after the end of twilight, and for this reason the Zodiacal Light becomes confused with it a short distance above the horizon. Nevertheless, the portion of the light cone between the horizon and the Milky Way was observed on April 7. The axis of the cone was between Aldebaran and the Pleiades and hence must have been rather near the ecliptic.

The Gegenschein has been invisible during the month because it has been lost in the glare of Jupiter. As it passes eastward along the ecliptic it will soon be away from the direction of Jupiter, but then it will be too far south to be seen to an advantage by northern observers, except perhaps under exceptionally favorable atmospheric conditions.

407 Scott Ave., Glenolden, Pennsylvania, April 17, 1934.

General Notes

Sir Arthur Eddington lectured at the University of Chicago on April 3 and April 5. The topics of the two lectures were: "The Expanding Universe" and "Science and Philosophy." Professor Eddington spent several days at the Yerkes Observatory.

Professor H. Rosenberg, Director of the Astronomical Observatory in Kiel, Germany, has been appointed visiting professor at the Yerkes Observatory of the University of Chicago, beginning May 1, 1934. This appointment is made possible through grants received by the University of Chicago from the Rockefeller Foundation and from the Emergency Committee in Aid of Displaced German Scholars.

Dr. Harlow Shapley, director of the Harvard College Observatory, is the recipient of the one hundred and seventh award of the Gold Medal of the Royal Astronomical Society. The award will be made at a meeting on Friday, May 11, at which time Dr. Shapley will deliver the George Darwin Lecture on "Some Structural Features of the Metagalaxy."

The *Journal of the British Astronomical Association*, Vol. 44, No. 5, contains a frontispiece photograph and also a brief but interesting biography of Dr. Shapley.

Demetrius Eginitis, professor of astronomy at the University of Athens and a member of the international committee on meteorology, died on March 14 at the age of seventy-one years.

Milwaukee Astronomical Society has issued Vol. 1, No. 3, of its publication, for April, 1934. This consists of eight pages which include some interesting

papers. The leading paper is by H. G. Thomson on The Development and Manufacture of Optical Glass, a topic very much in the minds of scientific people at present. Dr. Stebbins, of the Washburn Observatory, was a guest of this society recently.

The Rittenhouse Astronomical Society of Philadelphia held its monthly meeting in the Hall of The Franklin Institute, Twentieth Street and the Parkway, on Thursday evening, April 19. An address on the subject, "The Work of a Mountain Observatory," was given by Dr. Robert G. Aitken, Director of Lick Observatory. At this time, Dr. Aitken was presented with Honorary Membership in the Society.

New Zealand Astronomical Society.—The activity of this society is attested by the reports issued by it from time to time. Recently we have received its Variable Star Section Circular No. 14, which consists of fourteen large mimeographed pages of observations of variable stars made in the interval April, 1933, to November, 1933. More recently we have received a copy of *Monthly Notes* No. 85, for January, 1934. This contains formal reports on the work of the several sections for the year which ended September 30, 1933. Among other things we learn from it that Dr. J. S. Plaskett, Director of the Dominion Astrophysical Observatory, at Victoria, B. C., was made an honorary member of the society.

The 24-Hour System.—Members will have noticed with interest that the British Broadcasting Corporation has decided to adopt the 24-hour system of time regulation. This will be done in their broadcasting work, and also in their various publications. By this experiment a good test will be possible of the system, and some idea obtained as to whether the public are in favor of it for general adoption. So far the Government has not been persuaded that there is a sufficiently widespread demand for the change, although it is known that various interests such as rail, road, and air transport, shipping, engineering and the scientific world are in favor. The result of the B.B.C. experiment is therefore being awaited by the Postmaster-General before coming to any decision. (*Journal of the British Astronomical Association*, No. 5, 1933-34.)

The 200-inch Telescope.—This instrument, designed to surpass in size any instrument of this kind ever constructed, is rapidly coming to seem to be a reality. After many months of planning, experimenting, and preparation, the most significant step in the construction of it was taken on March 25 at the Corning Glass Works, Corning, New York. This step was the pouring of some twenty tons of borosilicate glass, at a temperature of 2,400 degrees Fahrenheit, into a circular mold approximately seventeen feet in diameter. This mold was built so that the huge piece of glass would be furrowed and grooved on the under side, the furrows and grooves to be used as places into which the mounting may be fitted and thus the mirror be held in accurately determined position. One or two of these forms became freed from their moorings during the pouring, presumably through the melting of the retaining bolts by the intense heat of the molten glass. The experts feel that this slight mishap does not have any important consequences.

Six thousand persons had assembled to witness this unusual and, if successful, epoch making event. In this group were many of the well-known men of science of America and at least one, Professor William L. Bragg, of England.

The mass of molten glass was immediately conveyed to an electrically controlled cooling chamber, where it will remain for a period of ten months for

cooling and annealing. The degree of success of the venture will be ascertainable only after this period. After this the disc will be sent to Pasadena, California, and brought to its proper shape for its ultimate purpose in the shops of the California Institute of Technology.

The progress of this undertaking will continue to be watched with eagerness by scientists the world over.

An 85½-inch Telescope.—Following closely upon the information concerning the pouring of the glass for the 200-inch mirror comes the somewhat unexpected, to most persons at least, news that a mirror of 85½ inches aperture was poured also by the Corning Glass Works on April 3. This mirror is destined for the Observatory of the University of Michigan, and is the gift of a person whose name is not given.

This unusual activity in the making of mirrors may indicate that astronomers are acting upon Sir Arthur Eddington's suggestion that it is desirable that the spiral nebulae be investigated fully before they "disappear in the distance!"

Calendar Reform.—The adoption of a new calendar is still a live question, as is clearly indicated by the resolutions adopted on March 26 at the Chicago convention of fraternal societies, representing a membership of 9,000,000, as follows:

"Whereas, proposals for the revision of the present calendar are now being internationally considered with a view to inaugurating the change in 1939; and whereas, any change in the present calendar will be a matter of concern and importance to the interests represented in this organization:

"Be it resolved, that the Presidents and Secretaries Sections of the National Fraternal Congress is opposed to any 13-month calendar, and favors the adoption of a 12-month perpetual calendar, of the type known in America as The World Calendar."

Amateur Astronomers in Buenos Aires.—The annual meeting of the Asociación Argentina "Amigos de la Astronomía," held last January in Buenos Aires, Rep. Argentina, commemorated the fifth anniversary of this institution and elected the following officers: Dr. Bernhard H. Dawson, president; José R. Naveira, vice-president; Carlos L. Segers, secretary and librarian; Martín Dartayet, assistant secretary; Alfred Völsch, treasurer; Joseph Galli, assistant treasurer; Carlos Cardalda, Ulises L. Bergara and Juan J. Nissen, members of the executive board.

Exchange of publications with other amateur societies is requested.

CARLOS L. SEGERS.

J. Bonifacio 1488, Buenos Aires, Rep. Argentina, or
Observatorio Astronómico, La Plata, Rep. Argentina.

Note on Method of Observing the Planet Venus.—The excessive brilliancy of the planet Venus makes its telescopic observation difficult, consequently recourse has been had to daylight observations, when the planet's light is diminished as a result of contrast with surrounding skylight. Reduction of objective aperture serves to avoid some of the glare, but involves loss of separating power; while the use of a color screen, although a better expedient than the former, does not improve definition to a satisfactory degree, merely absorbing excess light.

I have found that with my 4-inch refractor much better results are obtainable by using a Herschel helioscope, without color screen, the principle of the rejection of light (about 95%) by the wedge prism being the crux of the matter. During the past several weeks I have been studying Venus in this way and have been

much impressed by the superiority of the image, using powers up to 150. Observations have been continued through twilight until the sky becomes bright with the rising sun. The outstanding characteristics have been the sharpness of the limb, the softer outline of the terminator, and well defined cusps; no other details visible during the present apparition.

Beyond an aperture of, say, six to eight inches, a color screen (with optically polished surfaces, interposed between the prism and the eyepiece proper, as in the Brashear form) would doubtless further aid in gaining good definition.

H. B. RUMRILL.

Conestoga Road, Berwyn, Pennsylvania, March 26, 1934.

Book Reviews

L'Astronomie Egyptienne, par E. M. Antoniadi. (Gauthier-Villars, 55 Quai des Grands-Augustins, Paris. 40 francs.)

In this volume a well-known and highly-trained astronomer has turned his attention to a somewhat neglected field in the history of astronomy. The Egyptians had developed this science farther than any other people before the Greeks. This volume has as its purpose the establishing of this fact.

The author used as sources the contructions in the valley of the Nile, the inscriptions upon them, the papyri which are intact, and the writings of Greek historians. Before writing this book he read and translated all the important writ- to be found in the national library at Paris which had a bearing on this subject. On the basis of this careful study he formed certain definite conclusions and judgments which he sets forth in this volume.

The material is presented under the following headings: General; Greek philosophers and Egyptian priests; Astronomical deities and ideas of the universe; The Egyptian constellations; Sun, moon, planets, comets; The earth and the Egyptian calendar; The astronomy of the great pyramids.

Publications of the Vassar College Observatory, No. 4.

This number of these *Publications* consists of two parts, which together comprise sixty pages of print and a number of plate illustrations.

The first part has to do with the determination of the longitude of the Vassar College Observatory. This determination was based upon radio signals from Washington in 1926. The observing and work of reduction were done chiefly by Miss Laura E. Hill, and the preparation for publication was done under the direction of the director, Miss Caroline E. Furness. Incidentally Miss Furness has supplied a detailed and very interesting account of the development of astronomy at Vassar College from its beginning.

The value finally adopted as the longitude of the Vassar College Observatory is

$$4^h\ 55^m\ 35^s.16 \pm 0^s.024.$$

The second part of this number gives the results of A Study of Four Be Stars, by M. Alberta Hawes. These stars are β Monocerotis, 11 Camelopardalis, β Piscium, and HR 8731. Plates showing spectra of these stars are included.